



Western Regional
Climate Center



A Klamath Basin Integrated Drought Information System

Kelly Redmond



**Western Regional Climate Center
Desert Research Institute
Reno Nevada**



**California Drought Forum
Sacramento, California, 2014 May 15-16**



The Klamath Basin (1)

**Drains interior to coast. Fraser, Columbia, Klamath, (Pit (rare), Sacramento R).
~4000 ft Klamath Marsh to sea level.**

260 miles long

10.5 M acres (~15,700 sq mi; ~40,600 sq km)

Upper and Lower Basin, ~separator I-5 bridge below Iron Gate Dam

Two states, Oregon origin and California estuary

**2nd largest discharge in California (after Sacramento-San Joaquin)
17,000 cfs (484 cms), min 1310 to max 577,000 cfs at ocean**

3rd largest US West Coast salmon run (after Columbia, Sacramento)

Little attention outside the region. On the edge of many administrative units.

The Klamath Basin (2)

Has almost every western water issue

Agricultural production

Hydropower generation

Endangered species

Water quality

Municipal and industrial usage

Crosses state lines

Multiple agencies

Complex resource management setting

Tribal interests are a major factor

CA - Hoopa Valley, Karuk, Quartz Valley, Resighini, Yurok

OR - Klamath

Multiple and sometimes conflicting interests

Climate setting

No particular El Nino / La Nina allegiance. On the western dipole.

Difficult location for long-lead (monthly/seasonal) forecasts

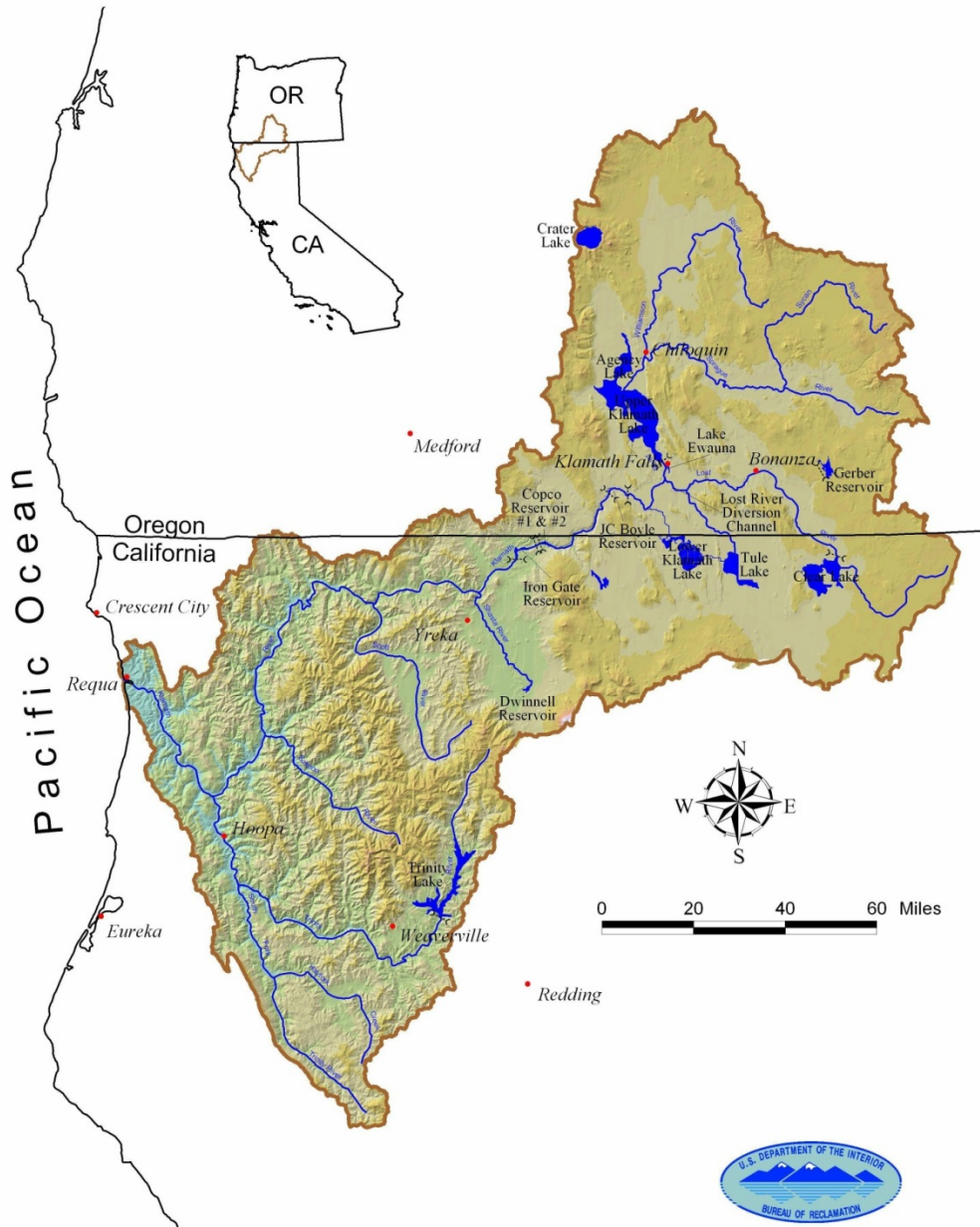
More “east-side” than “west-side.” Volcanic hydrology. “Upside down”

Joint USDA/NOAA water supply forecasts to 2009. Separate, collaborative, since.

Ecological Drought. Opportunities to think through this under-developed topic.

Klamath River Basin

From
Bureau of Reclamation



Selected Timeline

- 1868 First irrigation ditch in Upper Klamath Basin**
- 1905 Klamath Project authorized**
- 1908 Lower Klamath - first NWR established, by Teddy Roosevelt**
- 1918 First dam completed (Copco #1)**
- 2001 Water deliveries curtailed due to drought**
- 2002 Massive die-off of salmon (33,000 fish)**
- 2004 Klamath River Watershed Coordination Agreement CA, OR, EPA**
- 2010 Klamath Basin Restoration Agreement**
- 2010 Klamath Hydroelectric Settlement Agreement**
- 2013 Tribes and US Govt exercise Upper Klamath water rights, 1st time**

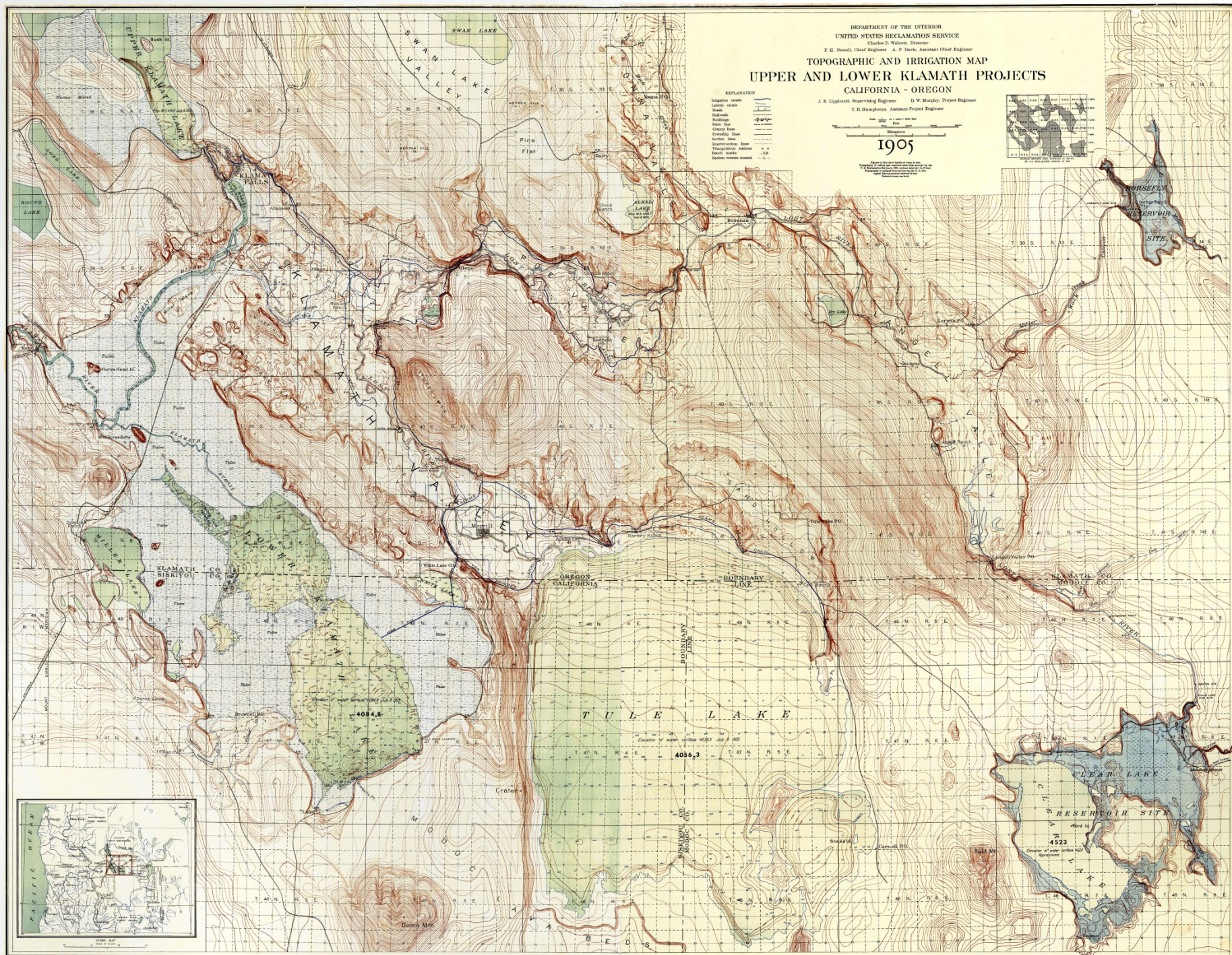
DEPARTMENT OF THE INTERIOR
UNITED STATES RECLAMATION SERVICE
Charles D. Wolcott, Director
F. H. Newell, Chief Engineer A. F. Davis, Assistant Chief Engineer
TOPOGRAPHIC AND IRRIGATION MAP
UPPER AND LOWER KLAMATH PROJECTS
CALIFORNIA - OREGON

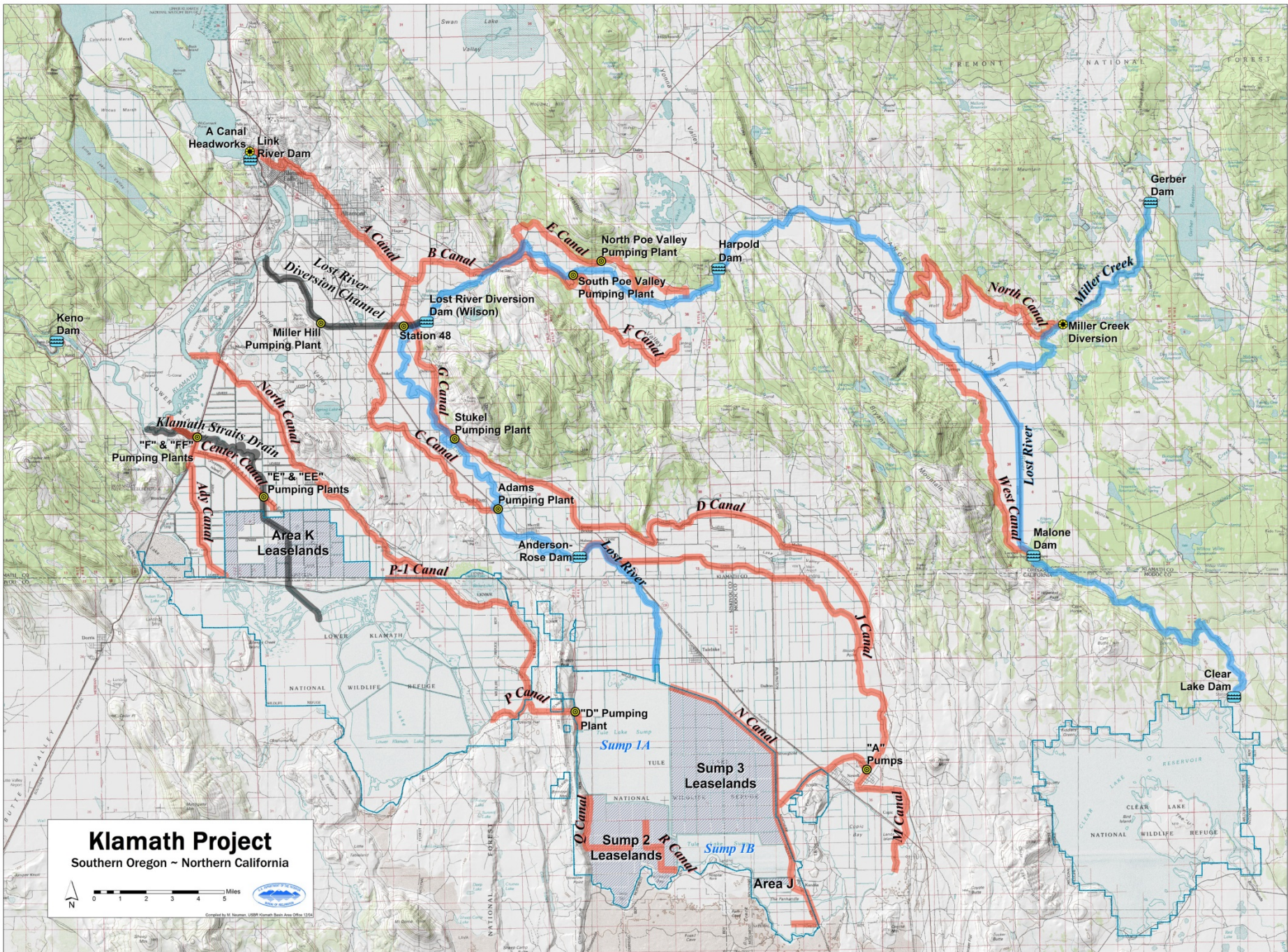
J. B. Lippincott, Supervising Engineer D. W. Murphy, Project Engineer
T. H. Humphreys, Assistant Project Engineer

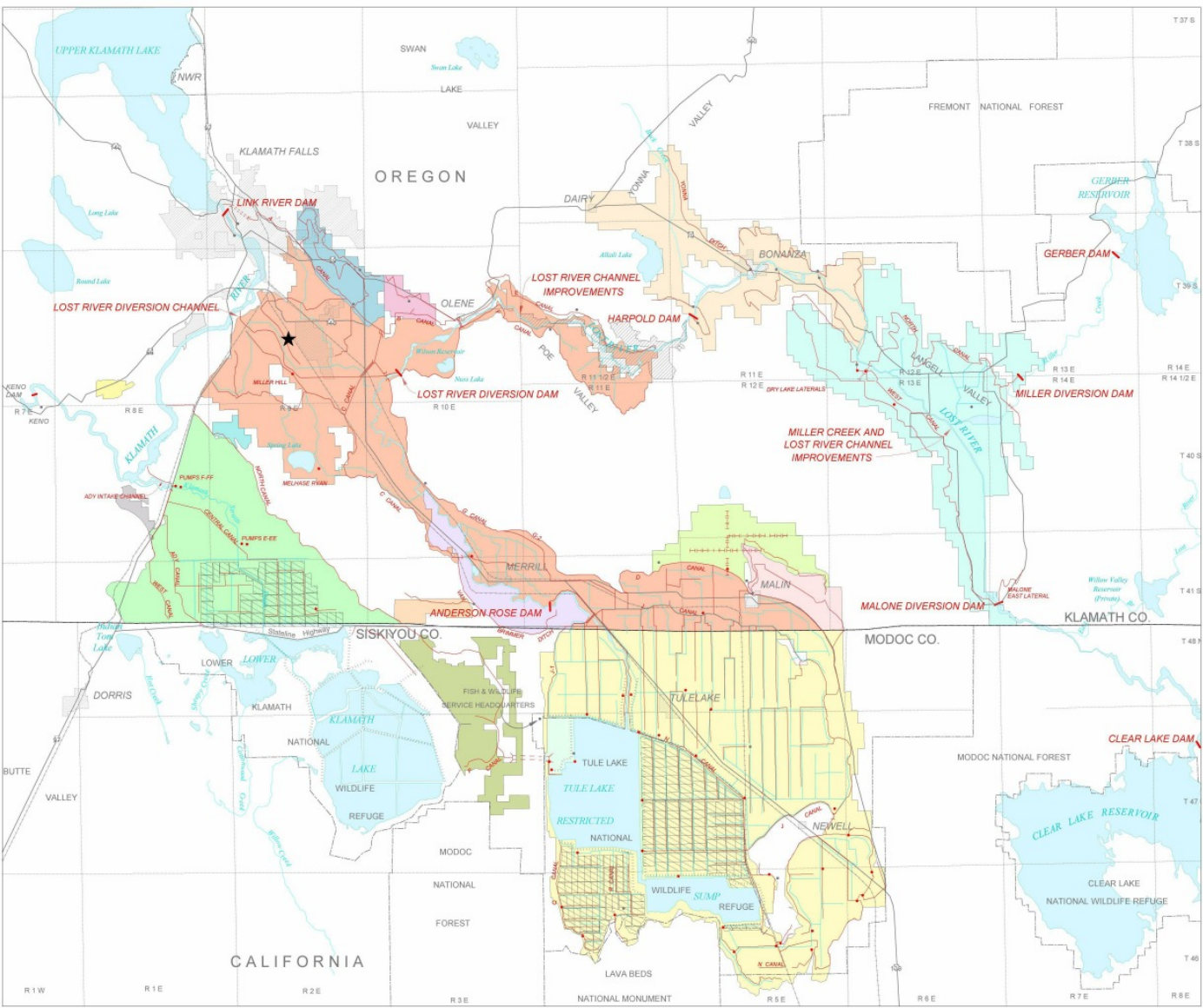
1905

EXPLANATION
Irregular contour
Levelled area
Road
Railroad
Stream
Canal
Troughing line
Section line
Quarter-section line
Topographical station
Bench mark
Section corner located

Scale of feet
0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
Scale of miles
0 10 20 30 40 50 60 70 80 90 100



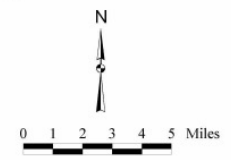




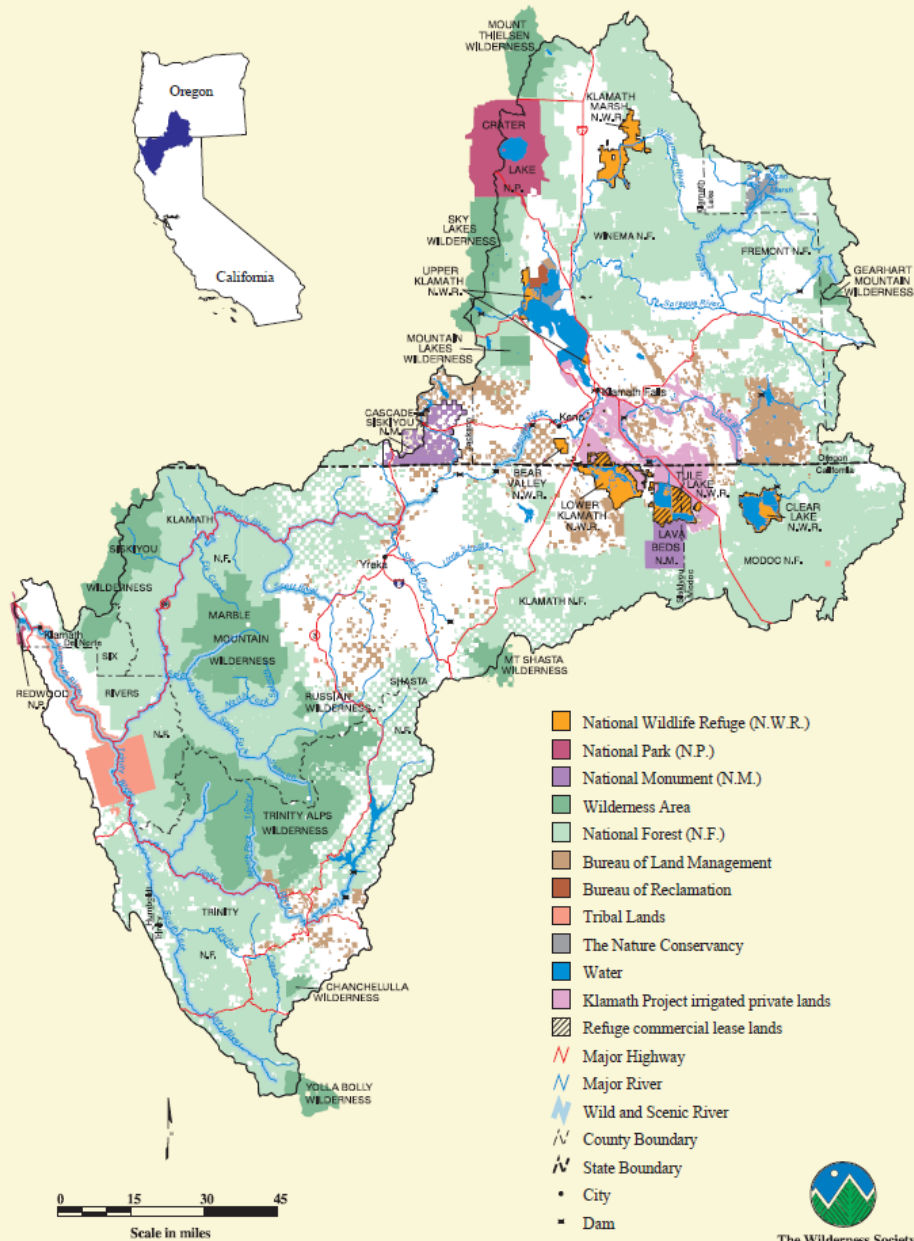
- FEATURES:**
- Hydrography
 - Canal
 - Drain
 - Dike
 - Tunnel
 - Flume
 - Siphon
 - Pipeline
 - Drop
 - Pumping Plant
 - Irrigation District Pumping Plant
 - Private Utility Powerplant
 - Project Headquarters
 - Project Land Lease Area
- MAJOR WATER DISTRICTS:**
- Ady Dist. Improv. Co.
 - Enterprise I.D.
 - Horsefly I.D.
 - Klamath Drain. Dist.
 - Klamath I.D.
 - Langel Valley I.D.
 - Malin I.D.
 - Midland Dist. Improv. Co.
 - P Canal Mutual Water Co.
 - Pine Grove I.D.
 - Pioneer Dist. Improv. Co.
 - Plevna Dist. Improv. Co.
 - Poe Valley Improv. Dist.
 - Shasta View I.D.
 - Sunnyside I.D.
 - Tulelake I.D.
 - Van Brimmer Ditch Co.
 - Westside Improv. Dist.

KLAMATH PROJECT

Oregon - California



Klamath River Basin



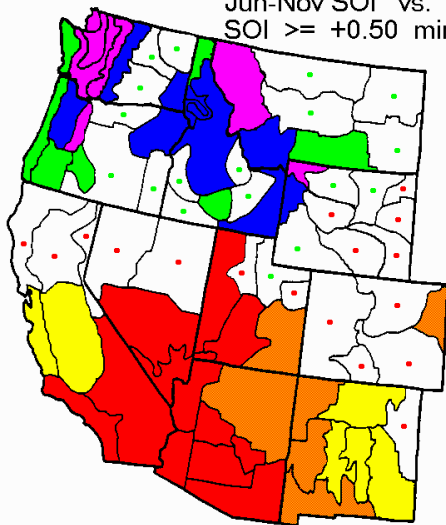
Multiple management organizations



The Wilderness Society
Center for Landscape Analysis

Split Samples:

Jun-Nov SOI vs. Oct-Mar Precip
SOI $\geq +0.50$ minus SOI ≤ -0.50



- $t > 0, p \leq 0.001$
- $t > 0, p \leq 0.01$
- $t > 0, p \leq 0.05$
- $t > 0, p > 0.05$
- $t < 0, p > 0.05$
- $t < 0, p \leq 0.05$
- $t < 0, p \leq 0.01$
- $t < 0, p \leq 0.001$

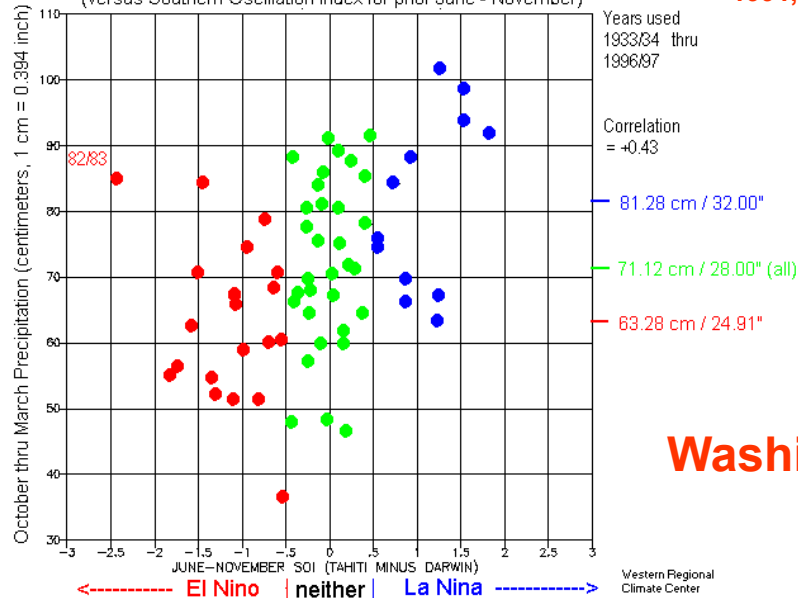
Updated from Redmond and Koch (1991). Winters of 1933/34 - 1994/95.
Reddish: Composite El Nino winters are wet, La Nina winters are dry.
Bluish/greenish: Composite El Nino winters are dry, La Nina winters are wet.

Redmond, K.T., and R.W. Koch, 1991. Surface climate and streamflow variability in the western United States and their relationship to large-scale circulation indices. Water Resources Research, 27(9), 2381-2399.

Redmond & Koch, 1991, updated.

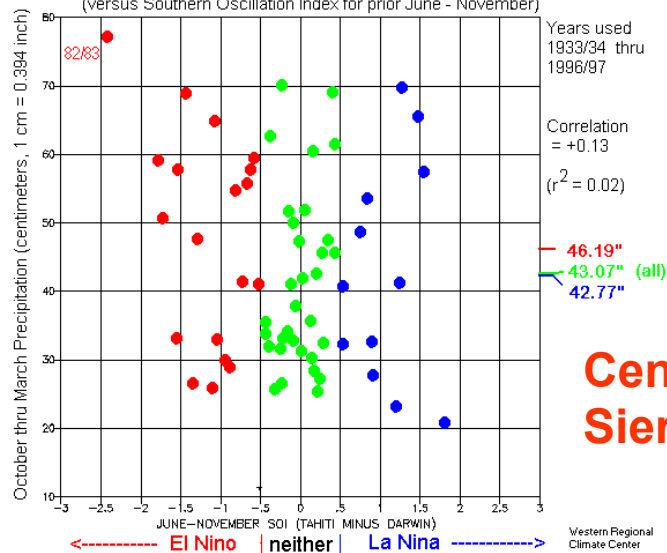
ENSO

Washington statewide October thru March Precipitation (versus Southern Oscillation Index for prior June - November)



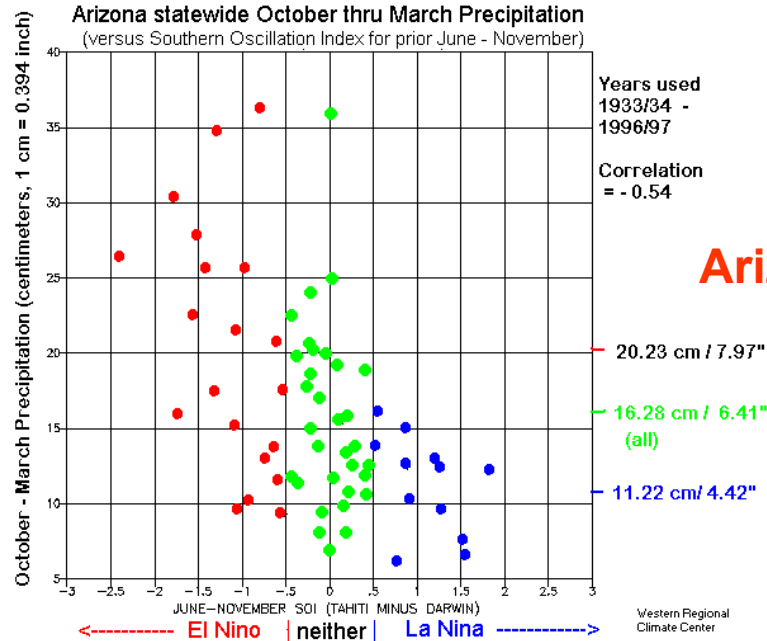
Washington

California 8-Station Index October thru March Precipitation (versus Southern Oscillation Index for prior June - November)



Central Sierra

Arizona statewide October thru March Precipitation (versus Southern Oscillation Index for prior June - November)



Arizona

National Integrated Drought Information System (NIDIS)

NIDIS aka: A Drought Early Warning System

Drought as a “slow onset” phenomenon.

No way that we should ever be taken by surprise by drought.

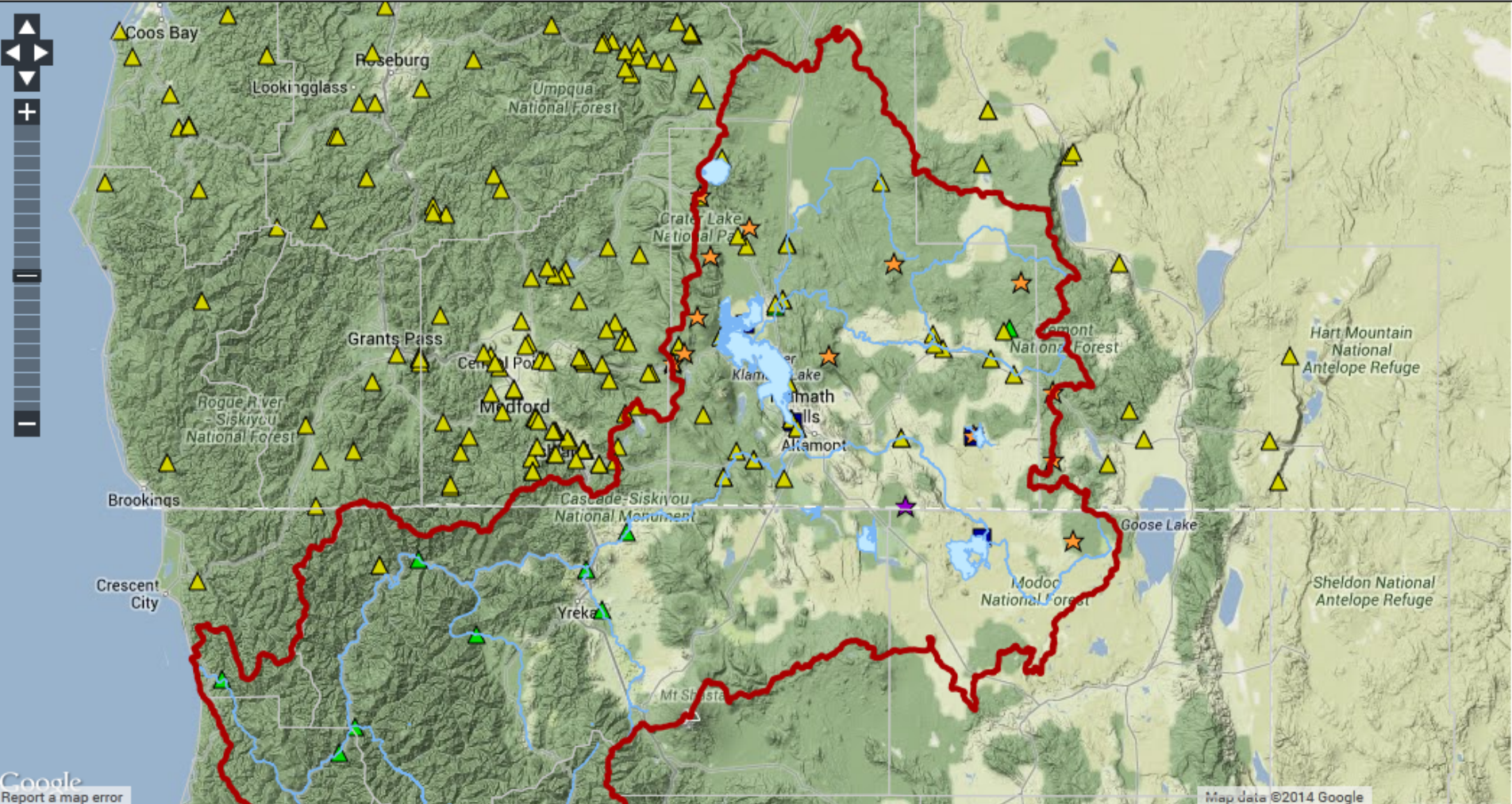
NIDIS, DEWS: Early Warning = Looking For Trouble

Klamath Basin Decision Support System

Klamath Basin DSS Watershed Viewer

[Home](#) [Layer Information](#) [Disclaimer](#) [Help](#)

[Get Info](#) [Print](#) [Markup Tools](#) [More Tools ...](#)



Related NOAA Sector Applications Research Project (SARP)

Houston Engineering Inc (MN) Dr. Mark Deutschman PI
NOAA National Weather Service
USDA Natural Resources Conservation Service
Klamath County Public Works Department

**From Fisheries Manager to Family Farmer: Improved Products for
Communicating Water Supply, Drought and Climate Change Risk for Daily
Decision Making within the Klamath Basin, California and Oregon, US.**
Two years: July 2012 - June 2014.

Stakeholder and focus group meetings in the basin

Draft Report

User Requirements Draft Report March 2014, Final Report April 2014

Insufficient understanding of stakeholder needs

How is NWS (CNRFC) and NRCS-NWCC info used?

What needs are met or not met?

How is uncertainty addressed?

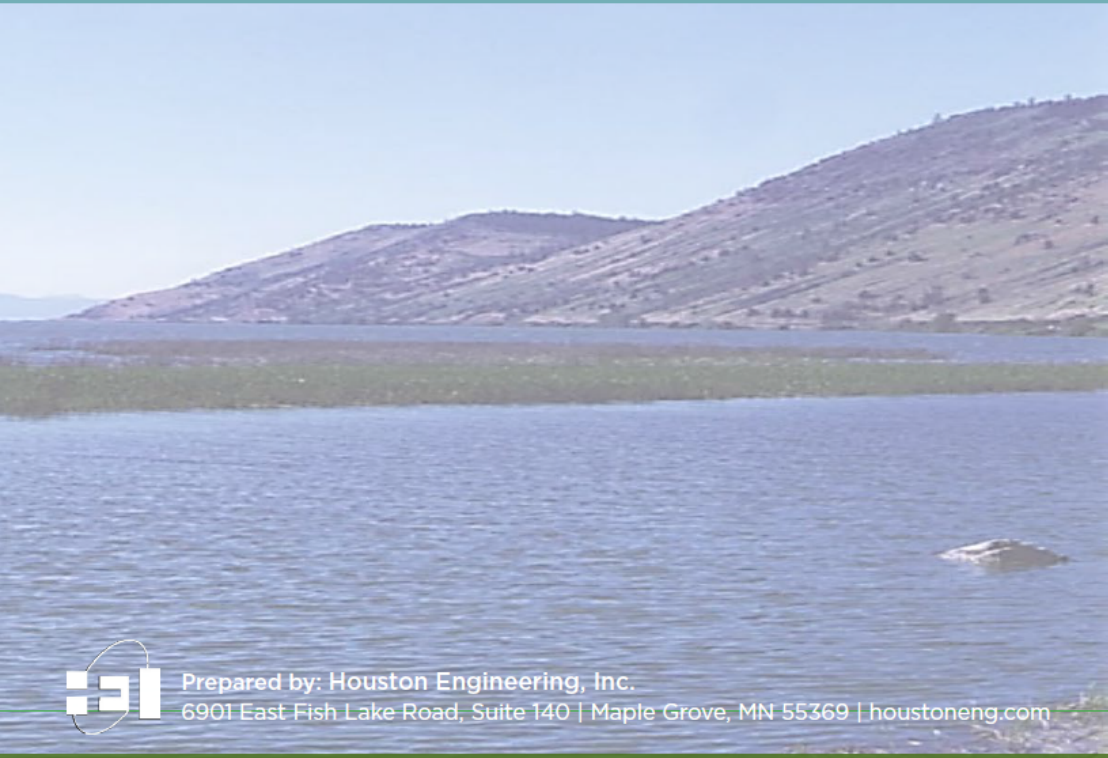
Matching the annual “decision calendar”

User Needs Report

Final • April, 2014

The Role of Climate and Water Resources Data in Societal Decisions
within the Klamath Basin of Oregon and California

A User Requirements Framework for the Western United States

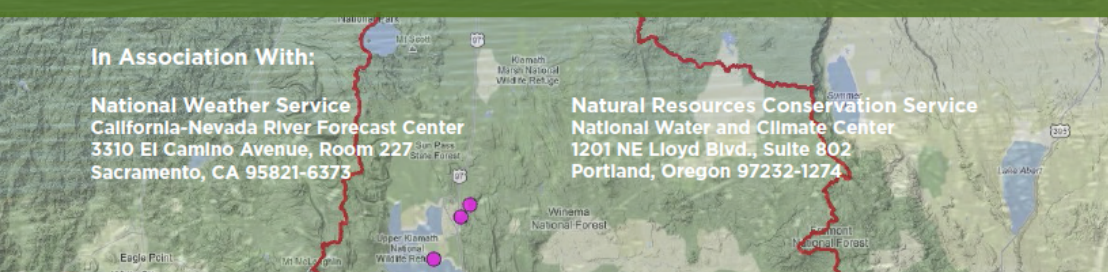


Prepared by: Houston Engineering, Inc.
6901 East Fish Lake Road, Suite 140 | Maple Grove, MN 55369 | houstoneng.com

In Association With:

National Weather Service
California-Nevada River Forecast Center
3310 El Camino Avenue, Room 227
Sacramento, CA 95821-6373

Natural Resources Conservation Service
National Water and Climate Center
1201 NE Lloyd Blvd., Suite 802
Portland, Oregon 97232-1274



**Prepared by Mark Deutschman,
Houston Engineering, Inc.
Minneapolis, Minnesota.**

167 pages, with appendices.

Very well done report.

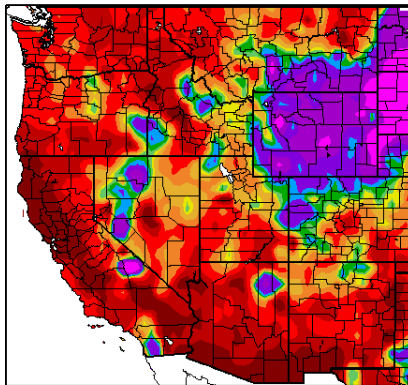
Many practical issues discussed.

Very relevant to NIDIS Pilot.

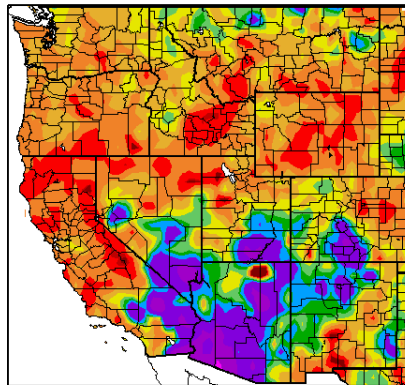
**Much applicability to other
western settings.**

Percent of Average Precipitation

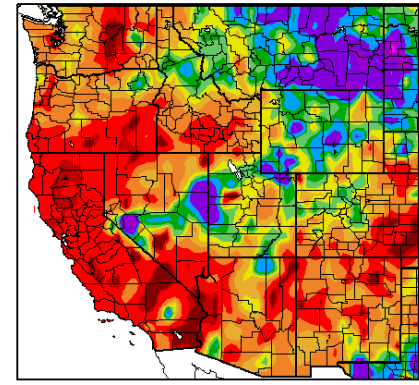
Percent of Normal Precipitation (%)
10/1/2013 – 10/31/2013



Percent of Normal Precipitation (%)
11/1/2013 – 11/30/2013



Percent of Normal Precipitation (%)
12/1/2013 – 12/31/2013



Generated 11/11/2013 at HPRCC using provisional data.

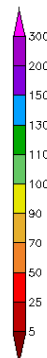
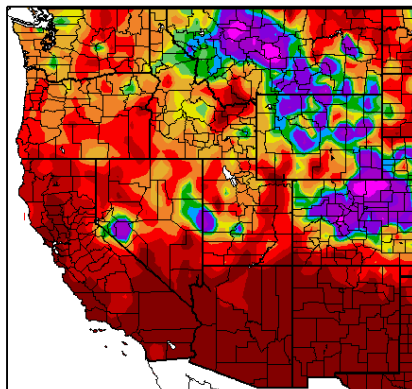
Regional Climate Centers Generated 12/11/2013 at HPRCC using provisional data.

Regional Climate Centers Generated 1/11/2014 at HPRCC using provisional data.

Regional Climate Centers

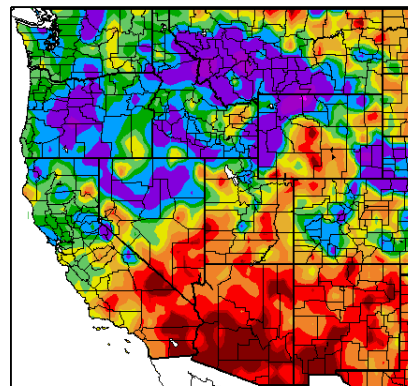
Oct 2013

Percent of Normal Precipitation (%)
1/1/2014 – 1/31/2014



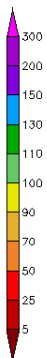
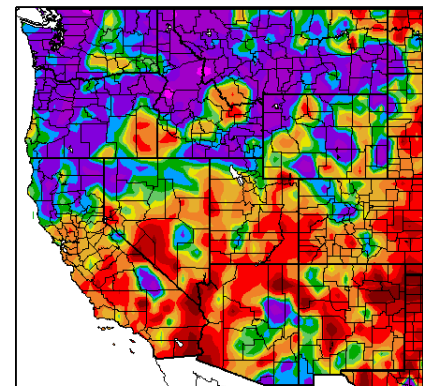
Nov 2013

Percent of Normal Precipitation (%)
2/1/2014 – 2/28/2014



Dec 2013

Percent of Normal Precipitation (%)
3/1/2014 – 3/31/2014



Generated 2/11/2014 at HPRCC using provisional data.

Regional Climate Centers Generated 3/11/2014 at HPRCC using provisional data.

Regional Climate Cent Generated 4/5/2014 at HPRCC using provisional data.

Regional Climate Centers

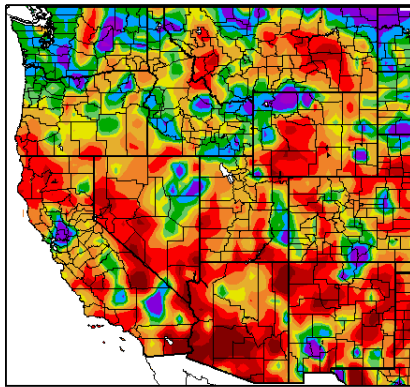
Jan 2014

Feb 2014

Mar 2014

Percent of Average Precipitation

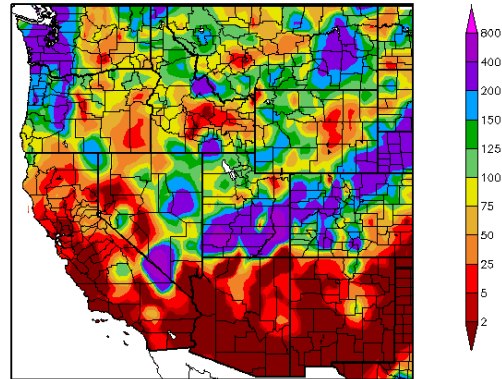
Percent of Normal Precipitation (%)
4/1/2014 – 4/30/2014



Generated 5/11/2014 at HPRCC using provisional data.

Regional Climate Centers

Percent of Normal Precipitation (%)
5/1/2014 – 5/13/2014



Generated 5/14/2014 at HPRCC using provisional data.

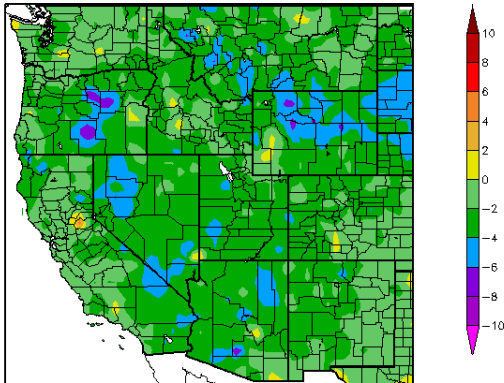
Regional Climate Centers

Apr 2014

May 2014 thru 13th

Mean Temperature Departure from Normal

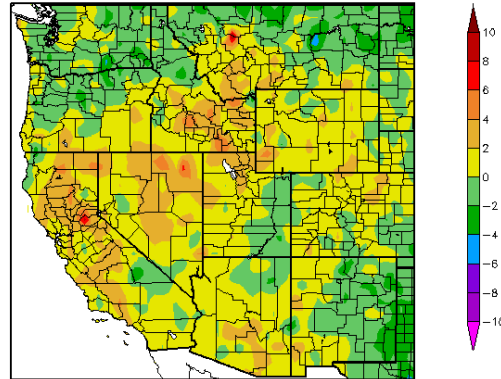
Departure from Normal Temperature (F)
10/1/2013 – 10/31/2013



Generated 11/11/2013 at HPRCC using provisional data.

Regional Climate Centers

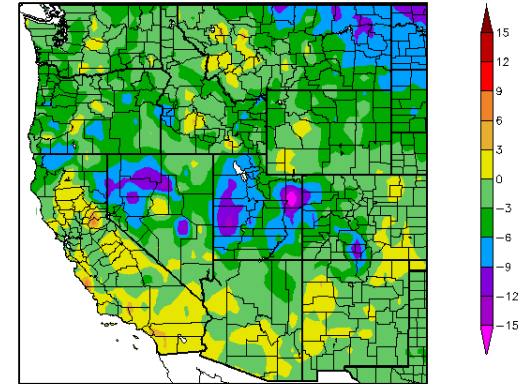
Departure from Normal Temperature (F)
11/1/2013 – 11/30/2013



Generated 12/11/2013 at HPRCC using provisional data.

Regional Climate Centers

Departure from Normal Temperature (F)
12/1/2013 – 12/31/2013

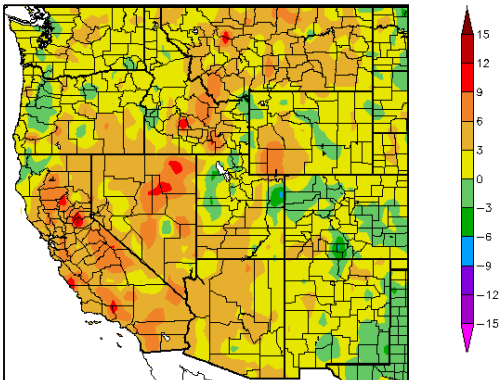


Generated 1/11/2014 at HPRCC using provisional data.

Regional Climate Centers

Oct 2013

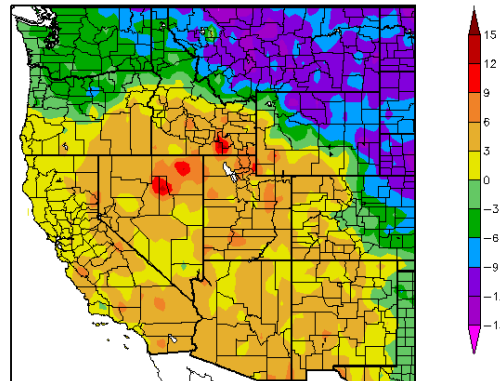
Departure from Normal Temperature (F)
1/1/2014 – 1/31/2014



Generated 2/11/2014 at HPRCC using provisional data.

Regional Climate Centers

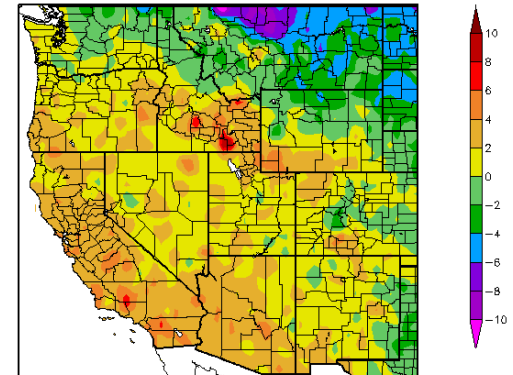
Departure from Normal Temperature (F)
2/1/2014 – 2/28/2014



Generated 3/11/2014 at HPRCC using provisional data.

Regional Climate Centers

Departure from Normal Temperature (F)
3/1/2014 – 3/31/2014



Generated 4/5/2014 at HPRCC using provisional data.

Regional Climate Centers

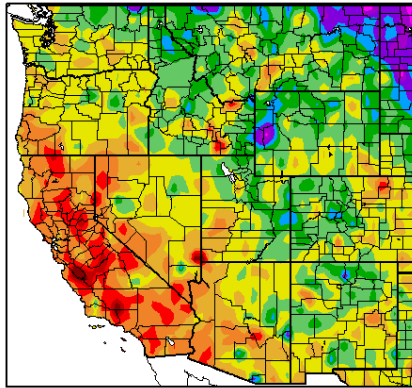
Jan 2014

Feb 2014

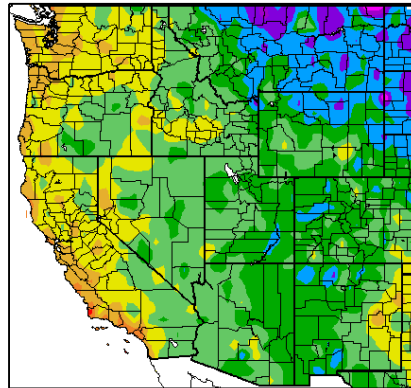
Mar 2014

Mean Temperature Departure from Normal

Departure from Normal Temperature (F)
4/1/2014 – 4/30/2014



Departure from Normal Temperature (F)
5/1/2014 – 5/13/2014



Generated 5/11/2014 at HPRCC using provisional data.

Regional Climate Centers Generated 5/14/2014 at HPRCC using provisional data.

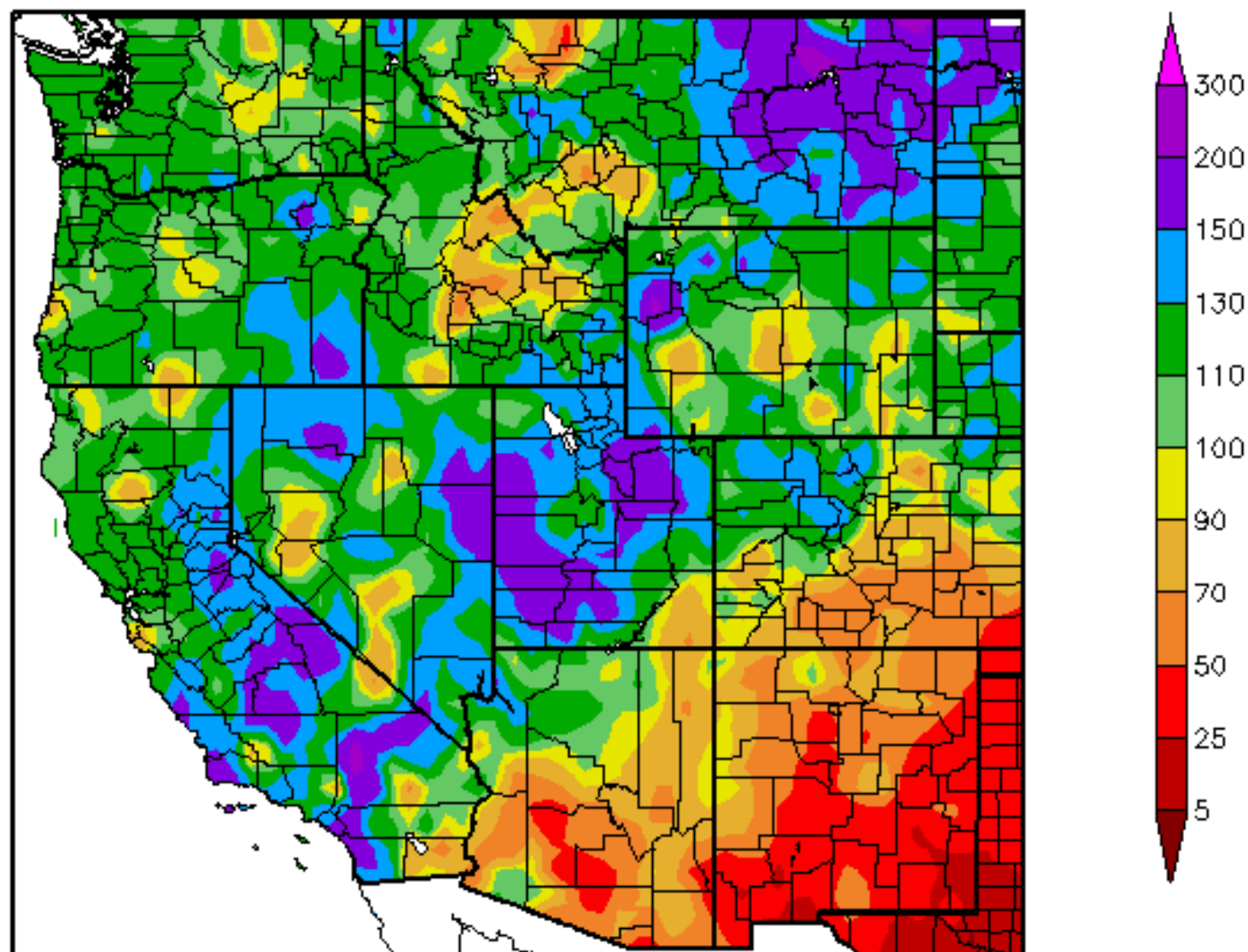
Regional Climate Centers

Apr 2014

May 2014 thru 13th

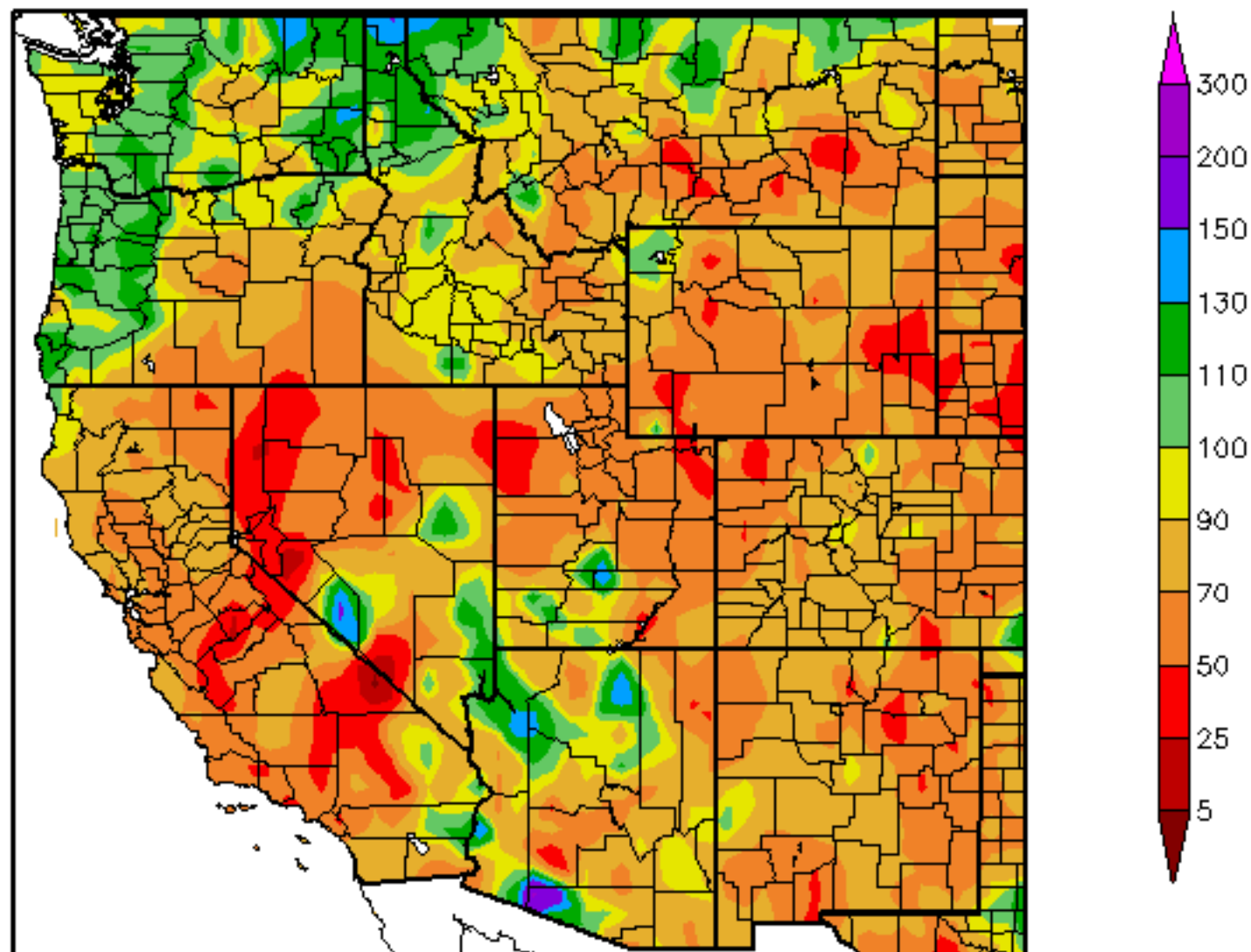
Water Year
2010-11
01 Oct 2010
Thru
30 Sep 2011

Percent of Normal Precipitation (%)
10/1/2010 - 9/30/2011



Water Year
2011-12
01 Oct 2011
Thru
30 Sep 2012

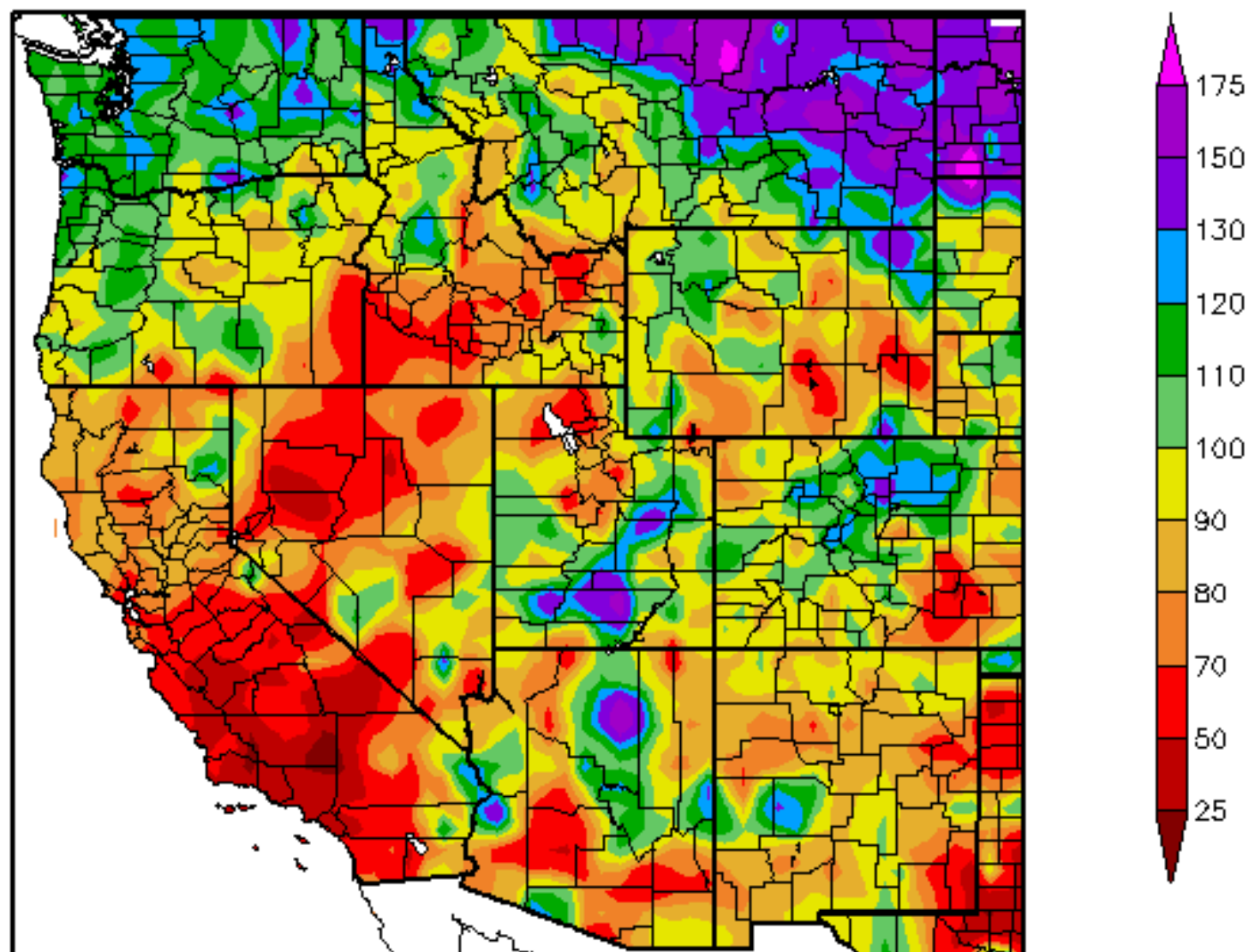
Percent of Normal Precipitation (%) 10/1/2011 – 9/30/2012



Water Year
2012-13
01 Oct 2012
Thru
30 Sep 2013

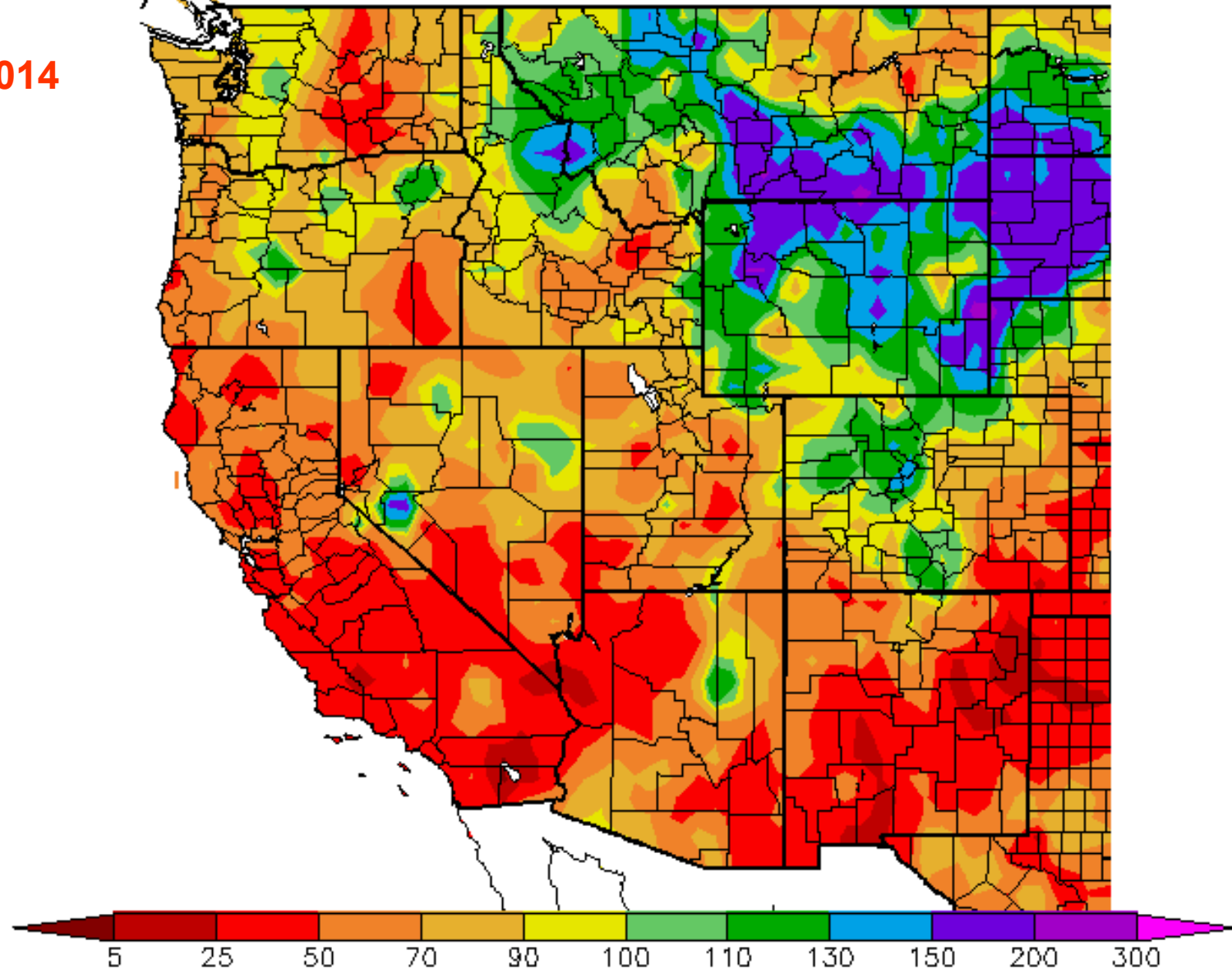
Percent of Normal Precipitation (%)

10/1/2012 – 9/30/2013



Water Year
2013-14 to date
01 Oct 2013
Thru
13 May 2014

Percent of Average Precipitation (%)
10/1/2013 - 4/19/2014



Generated 4/20/2014 at WRCC using provisional data.

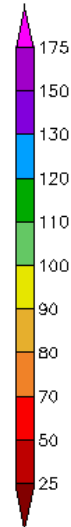
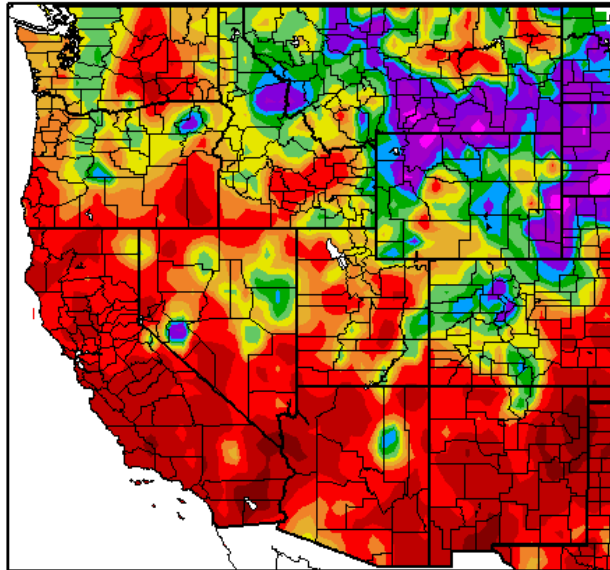
NOAA Regional Climate Centers

Oct 1 - May 13

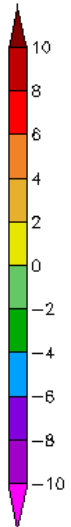
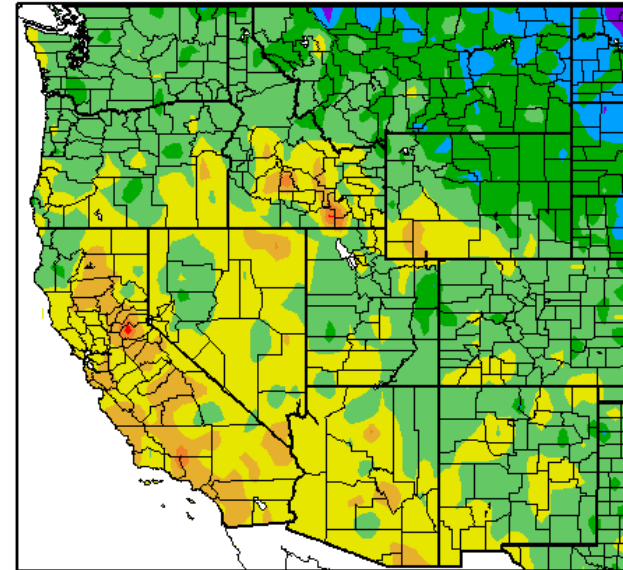
Water Year to Date 2013-2014

Oct 1 - May 13

Percent of Normal Precipitation (%)
10/1/2013 - 5/13/2014



Departure from Normal Temperature (F)
10/1/2013 - 5/13/2014



Generated 5/14/2014 at HPRCC using provisional data.

Regional Climate Centers Generated 5/14/2014 at HPRCC using provisional data.

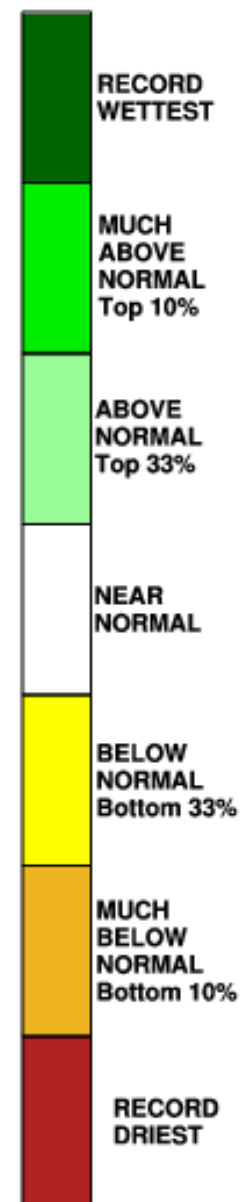
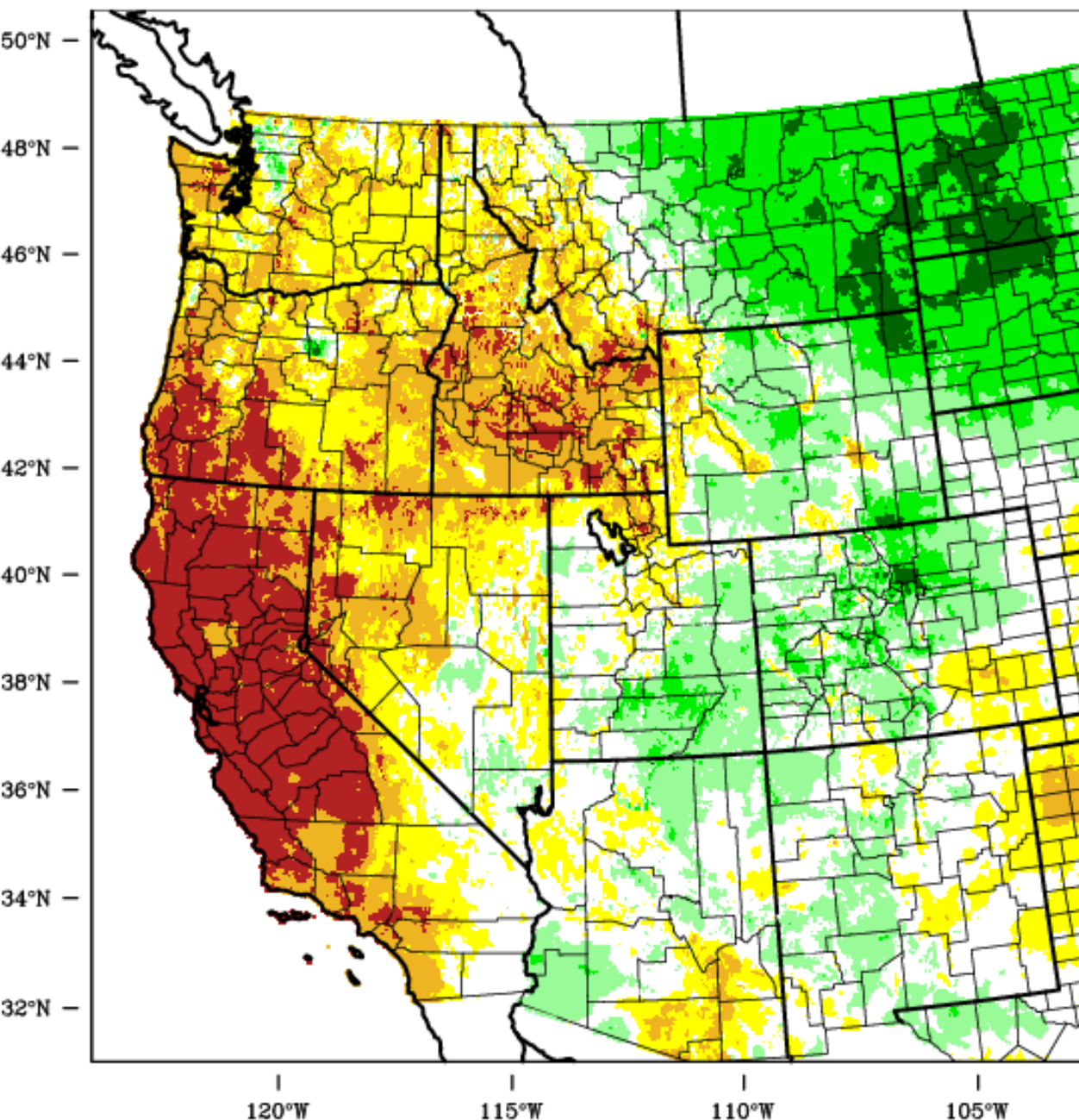
Regional Climate Centers

Precipitation Percent

Temperature Departure (F)

Western United States - Precipitation

January-December 2013 Percentile



Calendar Year
Precipitation
Rank

Jan-Dec
2013

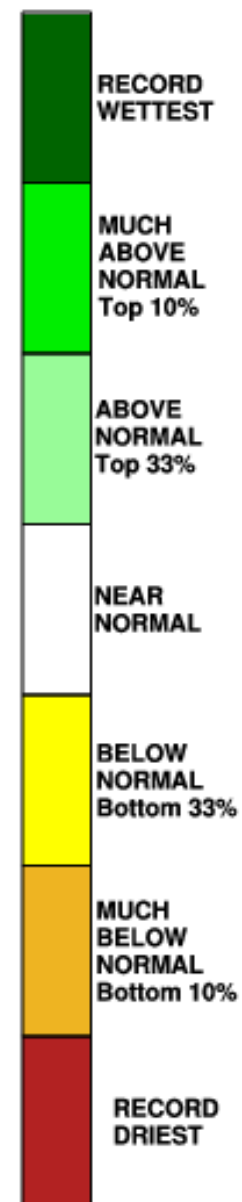
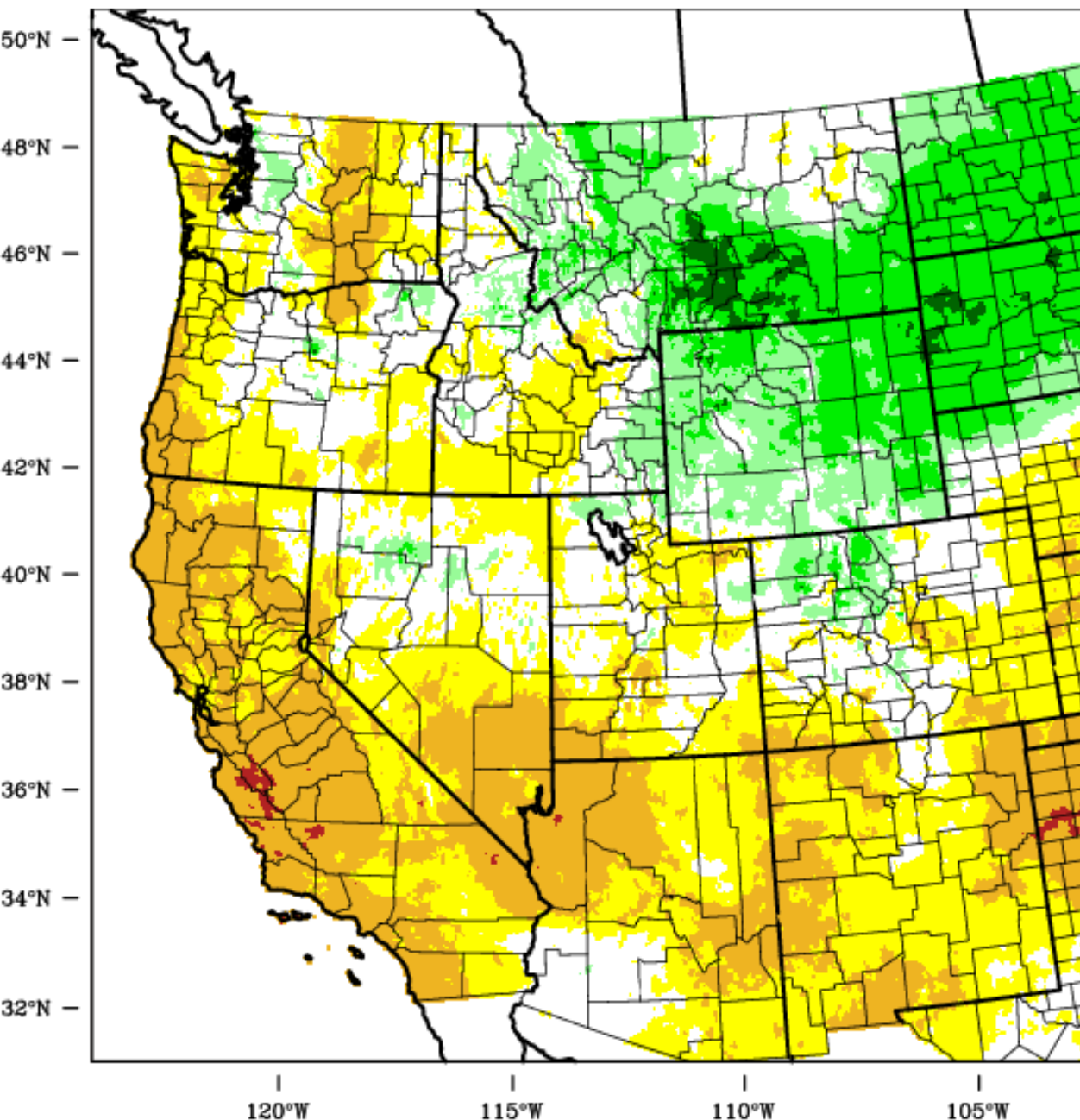
1896
Thru
2013

Lowest 10 %

Record
Driest

Western United States - Precipitation

October-April 2014 Percentile



**Oct-Apr
Precipitation
Rank**







**1895-96
Thru
2013-14**


Rankings (1895-2010)

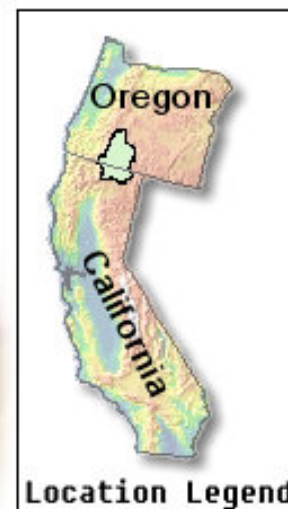
Lowest 10 %

**Record
Driest**

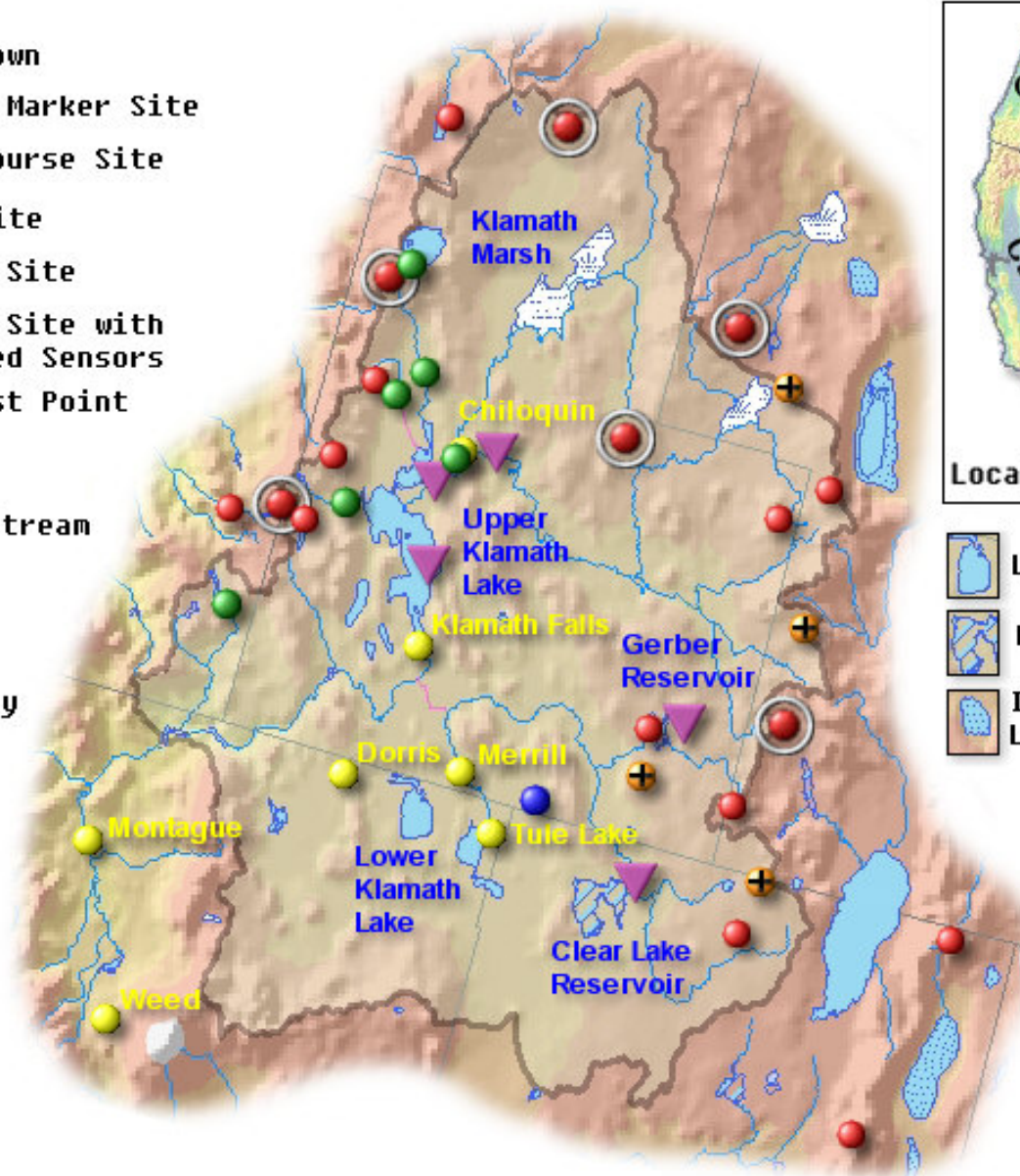
Upper Klamath Basin

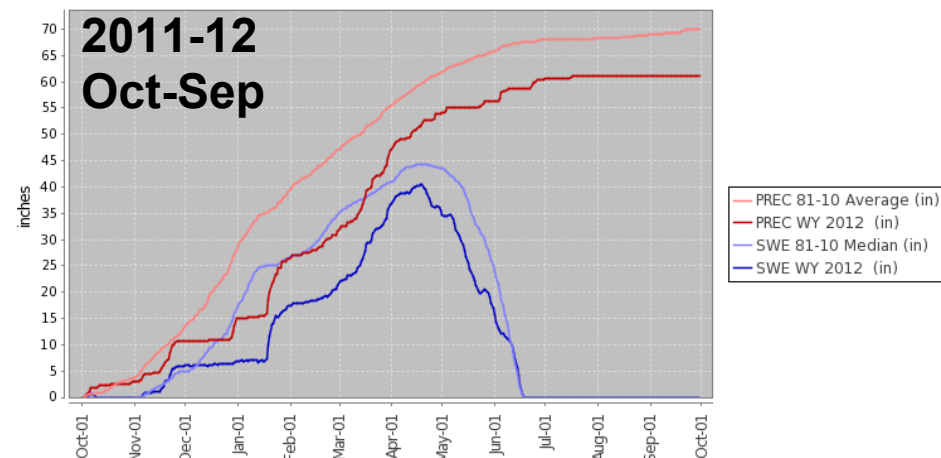
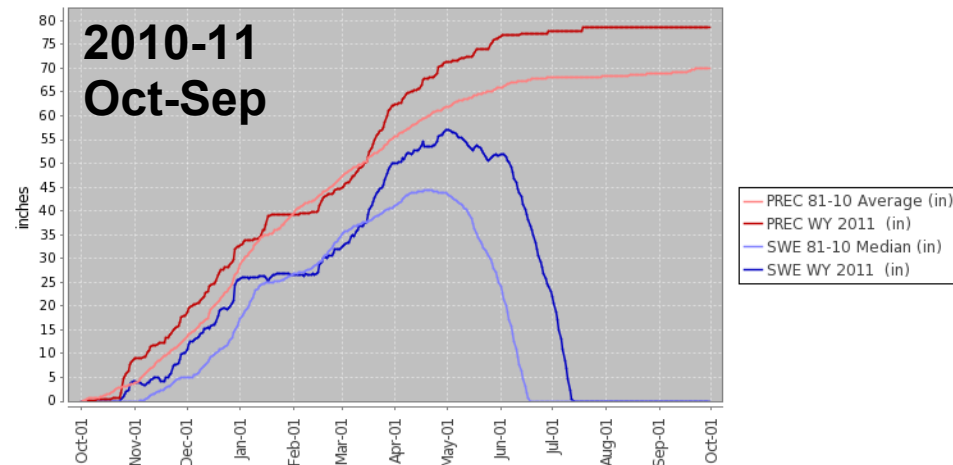
-  City/Town
-  Aerial Marker Site
-  Snow Course Site
-  SCAN Site
-  SNOTEL Site
-  SNOTEL Site with Enhanced Sensors
-  Forecast Point

-  River/Stream
-  Marsh
-  Basin Boundary

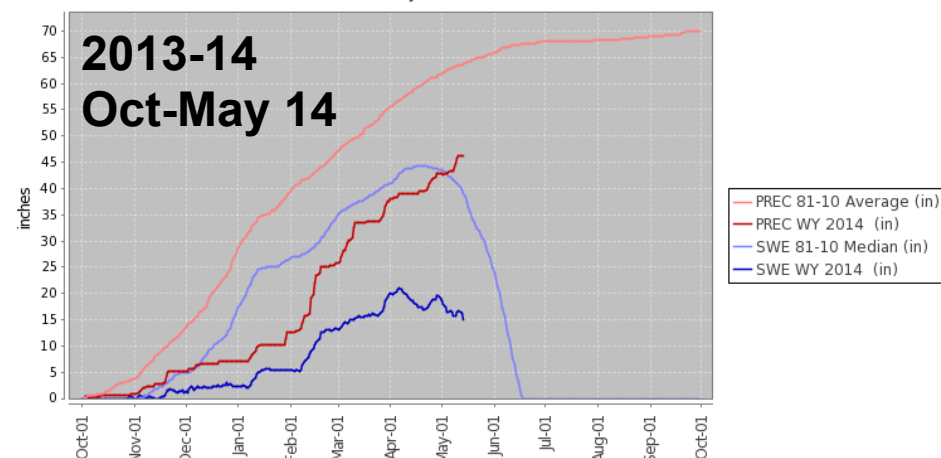
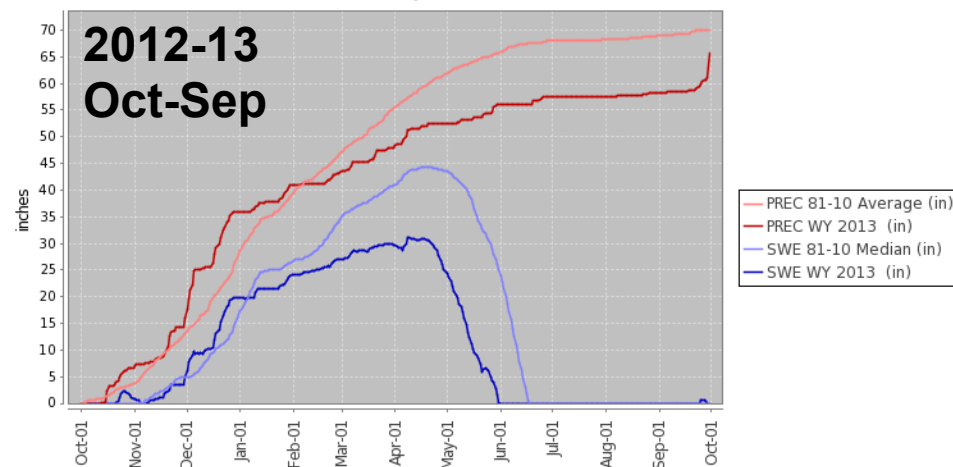


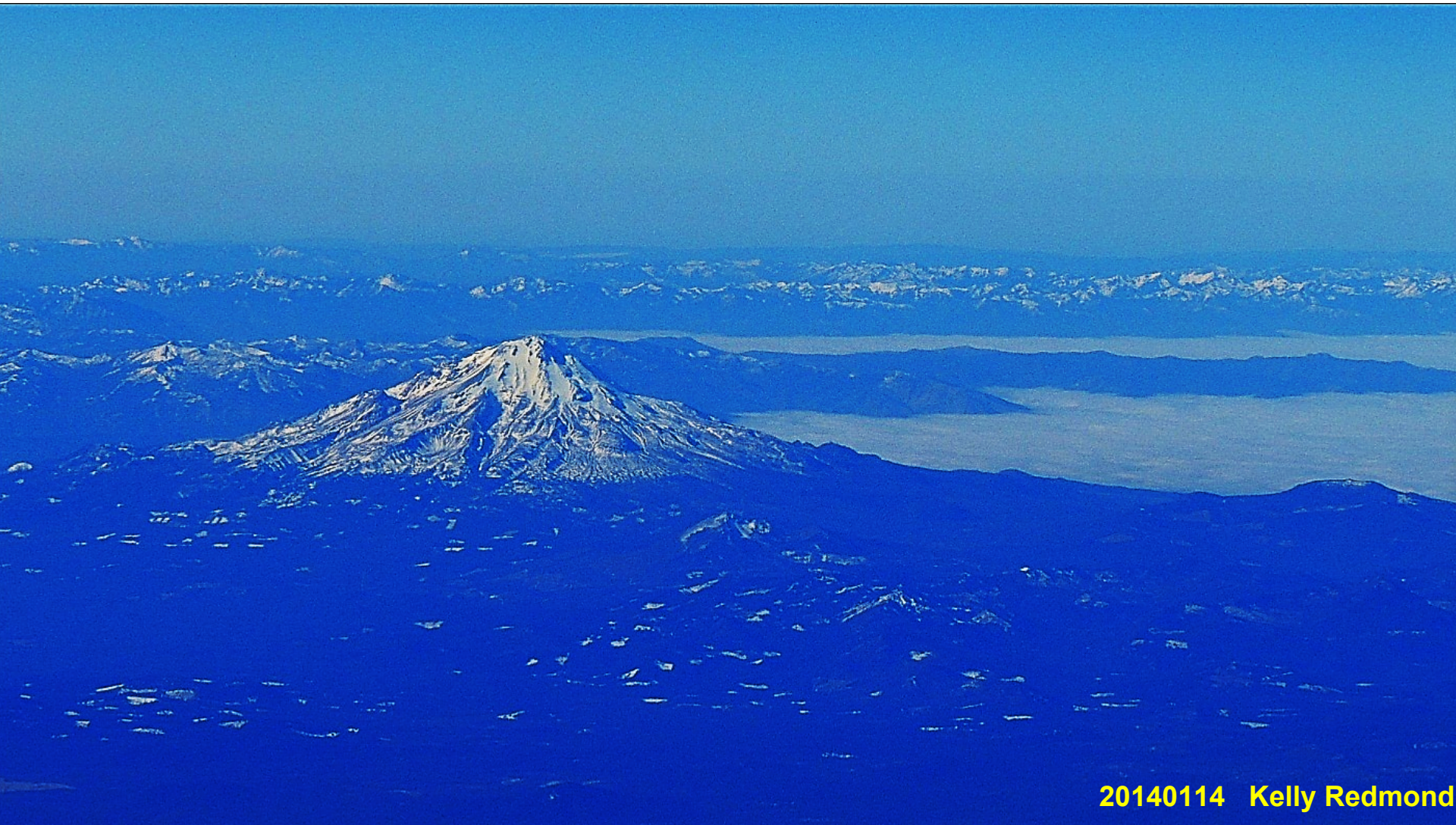
-  Lake
-  Reservoir
-  Intermittent Lake





Annie Springs (Crater Lake Nat Park) NRCS Snotel Station Winter Comparisons





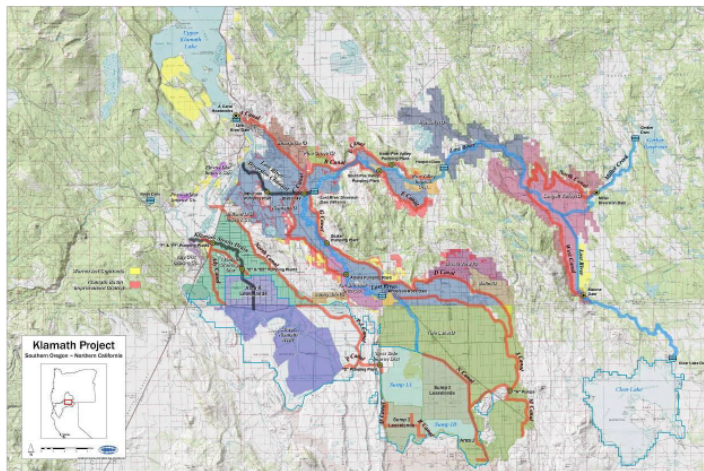
20140114 Kelly Redmond



20140114 Kelly Redmond

2014 Drought Plan

Klamath Project, Oregon-California
Mid Pacific Region



U.S. Department of the Interior
Bureau of Reclamation

May 2014

2014 Annual Operations Plan


Klamath Project, Oregon-California
Mid Pacific Region




U.S. Department of the Interior
Bureau of Reclamation



April 2014

Daily Water Resources Update


1  [Mouseover to select region](#)
 Current selection: All Regions

Web content below courtesy of: 

[Other Resources](#)

2 Select data type below:   Filter products by region: ☒ All regions ☐ CA/OR ☐ E. Side/NV | Filter by product type: Graphics: ☒ Text: ☐

[Precipitation](#)
[Snow](#)
[Observed Flow](#)
[Reservoirs](#)
[Forecast Flow](#)
[Point Forecasts](#)

3 Select product below:   Currently selected options are highlighted in **red**.

Seasonal %Avg

Water Year %Avg

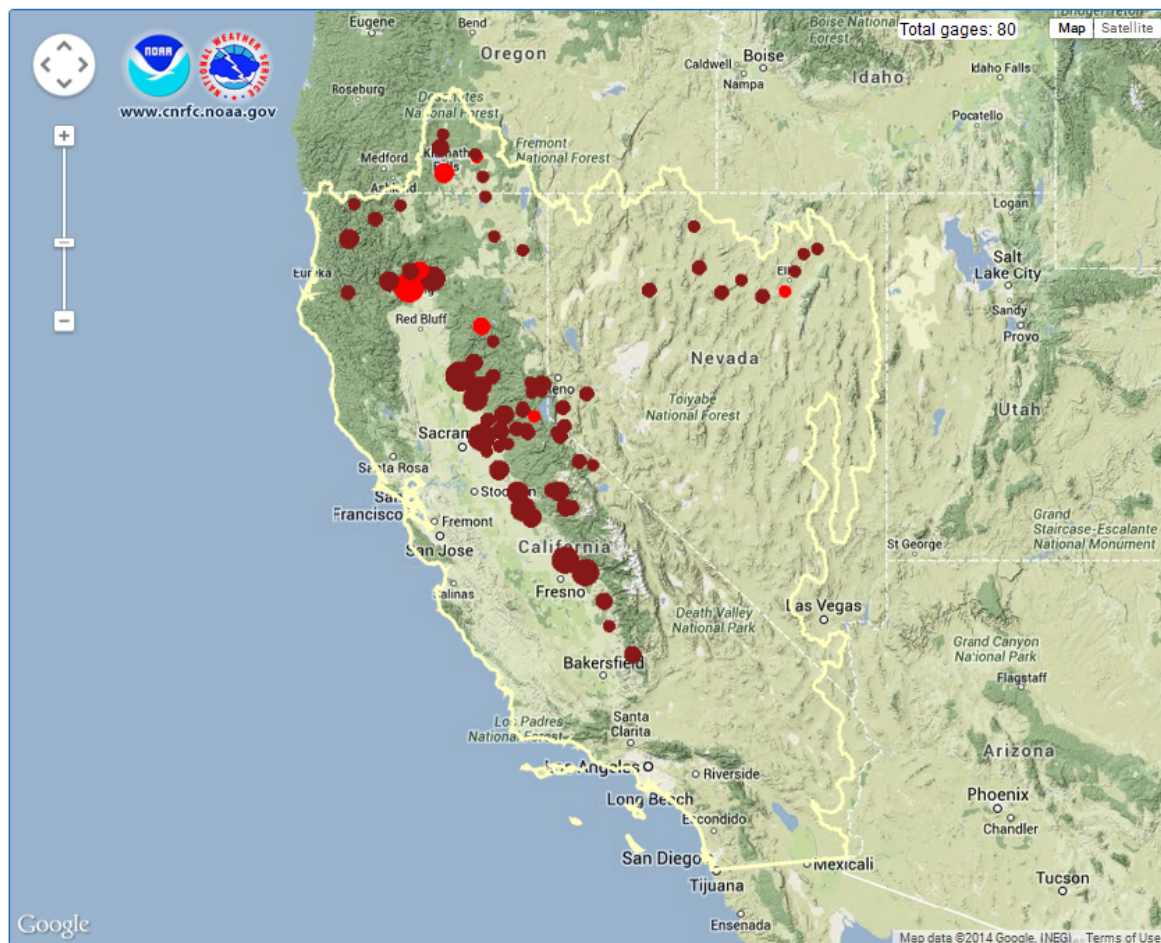
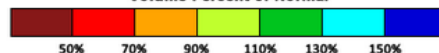
Spring Peak Flow Dates

Seasonal %Average Volume Forecast [Click for more options](#)

Data Mode: Map Controls:

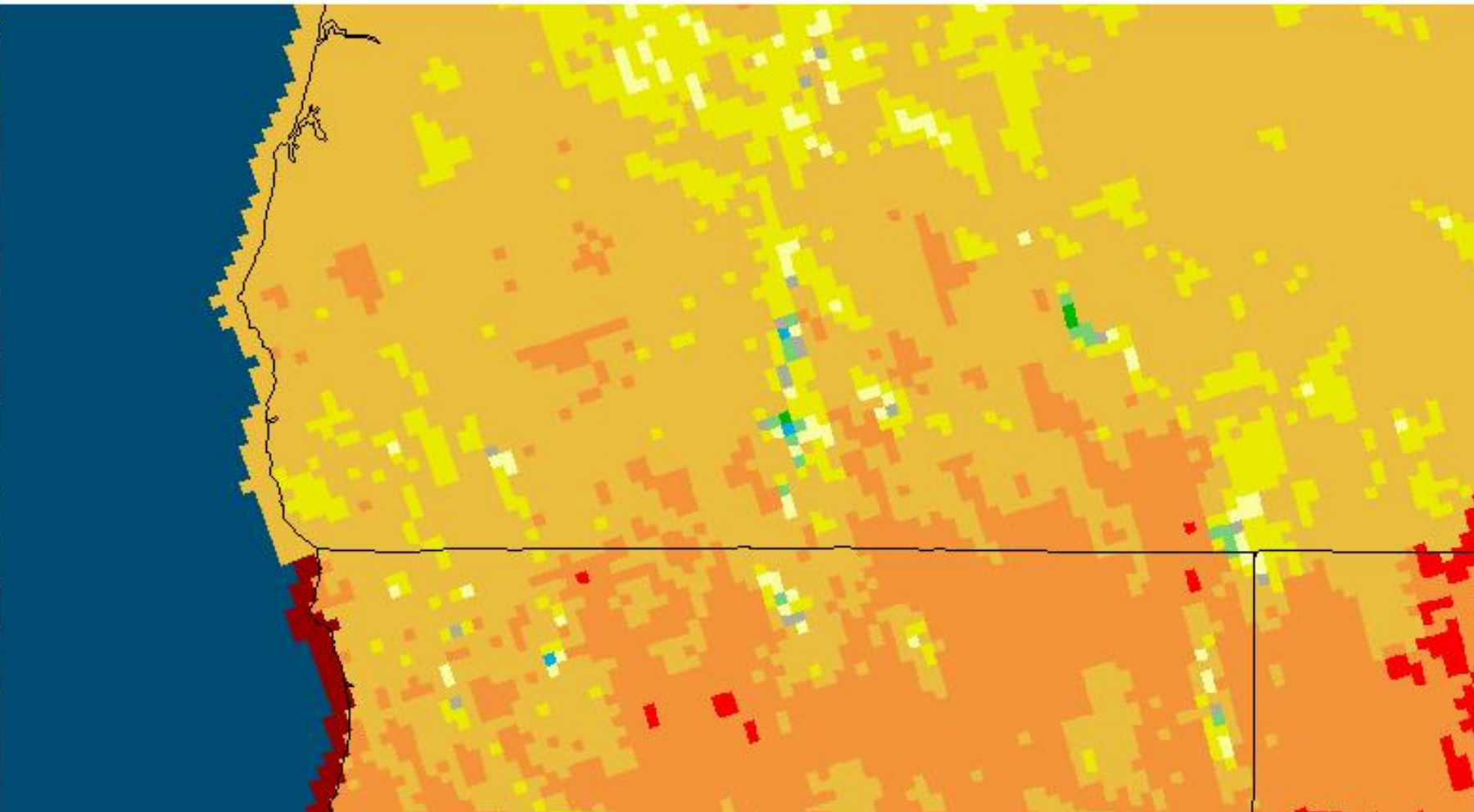
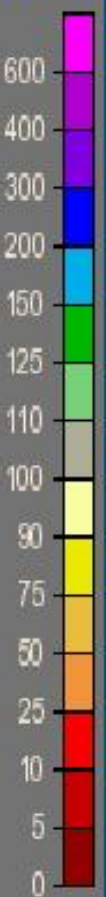
Created: Wed May 14 2014 at 8:21 AM PDT

Volume Percent of Normal



Medford, OR (MFR): Current Water-Year (Oct 1) Percent of Normal Precipitation
Valid at 5/14/2014 1200 UTC- Created 5/14/14 23:44 UTC

Percent



water.weather.gov/precip

Monthly Precipitation Summary Water Year 2014

Updated: Wed May 14 07:52:26 2014

The following is data from National Weather Service cooperative observers as of the end of last month. The water year starts on October 1 and ends on September 30. Precipitation data is provided for each month of the most recent water year, total precipitation for the water year, the percent of normal for the water year to date, and the percent of the entire water year we have received to date.

M stands for Missing Data. WY means Water Year. NA means that 30 year averages do not exist for this station. The units of the precipitation is inches.

If a station has any missing data, it's WY to Date total will also be missing. In addition the percent normal will not be calculated.

Any questions about this product should be directed to the CNRFC.

SOUTHERN OREGON COASTAL											
ID	Location	OCT	NOV	DEC	JAN	FEB	MAR	APR	WY to Date	Pct Avg to Date	Pct Tot WY
ASHO3	ASHLAND	0.43	0.90	1.10	0.73	4.02	3.66	1.48	12.32	78	62
CJV03	CAVE JUNCTION	0.04	2.34	1.18	1.65	9.81	10.12	1.34	26.48	46	42
GOL03	GOLD BEACH	1.09	4.89	2.07	4.72	11.02	12.13	3.32	39.24	57	51
GPS03	GRANTS PASS KAJO	0.19	2.52	0.19	1.02	5.70	6.40	0.97	16.99	61	55
GPS03	GREEN SPRINGS PP	0.60	0.34	0.66	0.58	3.30	2.90	1.35	9.73	51	41
LEMO3	LEMOLO LAKE	1.53	6.62	4.55	7.07	16.69	11.84	5.84	54.14	98	82
MFR	MEDFORD	0.20	1.12	0.36	0.78	4.55	3.50	0.82	11.33	75	62
OTH	NORTH BEND	0.76	2.70	2.16	2.69	8.03	5.35	3.55	25.24	44	39
PRS03	PROSPECT 2SW	0.28	3.28	1.64	3.62	8.52	7.14	3.67	28.15	80	67
RID03	RIDDLE	0.53	2.09	1.30	1.73	5.18	4.19	0.92	15.94	59	51
ROGO3	ROSEBURG	0.53	3.11	1.11	2.05	6.51	4.98	1.98	20.27	70	60
SXT	SEXTON SUMMIT	0.46	3.00	1.08	1.11	7.63	7.45	1.16	21.89	72	62
TKFO3	TOKETEE FALLS	1.01	4.75	2.11	3.97	9.21	9.32	4.31	34.68	87	72
WIN03	WINCHESTER DAM	0.45	3.08	0.99	2.04	6.45	5.07	1.89	19.97	64	55
WLM03	WILLIAMS	0.05	1.82	0.67	1.22	7.88	6.23	0.44	18.31	63	56

OREGON CLOSED BASINS											
ID	Location	OCT	NOV	DEC	JAN	FEB	MAR	APR	WY to Date	Pct Avg to Date	Pct Tot WY
HMR03	HART MOUNTAIN REF	1.34	0.48	0.18	0.42	1.51	0.93	1.83	6.69	79	53
PAS03	PAISLEY	0.32	0.15	0.01	0.05	1.25	1.38	1.09	4.25	57	38
SMM03	SUMMER LAKE	0.40	0.56	0.26	0.74	2.77	2.05	0.85	7.63	80	57
SVL03	SILVER LAKE	0.30	0.37	0.26	0.28	1.53	M	0.50	M		

NORTHERN CALIFORNIA COASTAL											
ID	Location	OCT	NOV	DEC	JAN	FEB	MAR	APR	WY to Date	Pct Avg to Date	Pct Tot WY
CEC	CRESCENT CITY ASOS	0.11	2.52	1.31	2.15	9.49	7.31	2.32	25.21	44	39
CVLC1	COVELO	M	2.11	0.40	M	9.20	8.69	M	M		
EKA	EUREKA	0.05	1.29	0.56	1.35	6.09	6.25	1.37	16.96	46	42
FORC1	FORT ROSS	M	M	M	M	M	M	M	M		
FRBC1	FT BRAGG 5N	0.00	1.45	0.27	2.21	7.69	8.46	1.71	21.79	54	50
GASC1	GASQUET RS	0.04	5.02	2.35	3.55	18.67	17.19	4.36	51.18	62	56
SCOC1	SCOTIA	0.03	0.88	0.64	0.87	4.19	7.25	0.94	14.80	32	30

UPPER KLAMATH											
ID	Location	OCT	NOV	DEC	JAN	FEB	MAR	APR	WY to Date	Pct Avg to Date	Pct Tot WY
CHE03	CHEMILT	0.26	1.19	1.04	M	M	M	M	M		
CHQ03	CHILOQUIN TNW	0.49	M	1.05	1.51	5.09	3.03	M	M		
CRL03	CRATER LAKE NP	0.79	6.44	3.09	6.69	12.89	12.19	5.02	48.11	85	73
GBZ03	GERBER	0.10	0.70	0.40	M	M	M	M	M		
HOW03	HOWARD PRAIRIE	0.85	1.24	1.31	1.64	5.80	4.47	2.38	17.69	67	56
KEN03	KENO	0.03	0.37	0.54	0.80	3.40	2.45	0.94	8.53	53	43
LMT	KLAMATH FALLS	0.01	0.34	0.28	0.21	2.34	1.94	0.20	5.32	48	36

LOWER KLAMATH											
ID	Location	OCT	NOV	DEC	JAN	FEB	MAR	APR	WY to Date	Pct Avg to Date	Pct Tot WY
BBAC1	BIG BAR 4E	0.01	1.15	0.83	1.26	5.70	5.85	1.13	15.93	48	44
CHNC1	CALLAHAN	0.25	0.47	0.38	0.75	3.59	2.40	0.17	8.01	44	37
COPC1	COPCO #1 DAM	0.26	0.57	0.19	0.69	3.88	3.70	1.89	11.18	65	53
FOJC1	FORT JONES	0.00	0.53	0.48	0.78	2.58	4.12	0.28	8.77	48	41
HPAC1	HOOPA	0.00	1.54	1.06	1.79	8.25	2.82	0.97	16.43	NA	NA
HPYC1	HAPPY CAMP	0.07	2.04	1.02	1.42	8.76	8.83	1.30	23.44	50	46
HYAC1	HYAMPOM	0.01	1.53	0.46	1.06	6.35	8.85	M	M		
MTHC1	MT. HEBRON RS	0.16	0.59	0.00	0.15	1.37	0.94	0.28	3.49	39	29
ORLC1	ORLEANS	0.02	1.63	1.04	1.80	13.63	11.13	1.66	30.91	63	58
STGC1	LAVA BEDS NM	0.11	0.50	0.16	0.25	1.50	1.28	4.88	8.68	78	57
TRHC1	TRINITY RIVER HATCHERY	0.11	1.41	0.37	0.83	5.62	6.66	M	M		
TULC1	TULE LAKE	0.05	0.33	0.17	0.33	1.59	1.46	0.49	4.42	52	38
WEAC1	WEA/ERVILLE	0.01	1.42	0.48	0.99	6.22	8.50	0.42	18.04	51	46
WLLC1	WILLOW CREEK 1NW	0.00	1.68	0.50	1.72	8.33	2.44	0.72	15.39	30	28
YKAC1	YREKA	0.02	0.57	0.20	1.96	3.01	3.36	0.36	9.48	58	48

www.cnrfc.noaa.gov/monthly_precip.php

Forecast by "City, St" or ZIP





XML **RSS Feeds**

- Current Hazards**
 - Watches / Warnings
 - Outlooks
 - NOAA Watch
 - Submit a Spotter Report
- Current Conditions**
 - Observations
 - Radar
 - Satellite
 - Precipitation
- Forecasts**
 - Forecast Discussion
 - Local Area
 - Activity Planner
 - Aviation Weather
 - Fire Weather
 - Marine Weather
 - Severe Weather
 - Hurricane Center
 - User Defined Area
 - Pass and Recreation
- Hydrology**
 - Rivers and Lakes
 - AHPS
- Climate**
 - Local
 - National
 - Drought
 - More...
 - Climate portal
- Weather Safety**
 - Preparedness
 - Weather Radio
 - SkyWarn™
 - TsunamiReady
 - Tsunami Inundation
- Maps**
- Additional Info**
 - Items of Interest
 - Other Useful Links
 - Education Resources
 - COOP Observer
 - Our Office
 - Road conditions
 - NWS News
- Contact Us**


Experimental Forecast Reference Crop Evapotranspiration

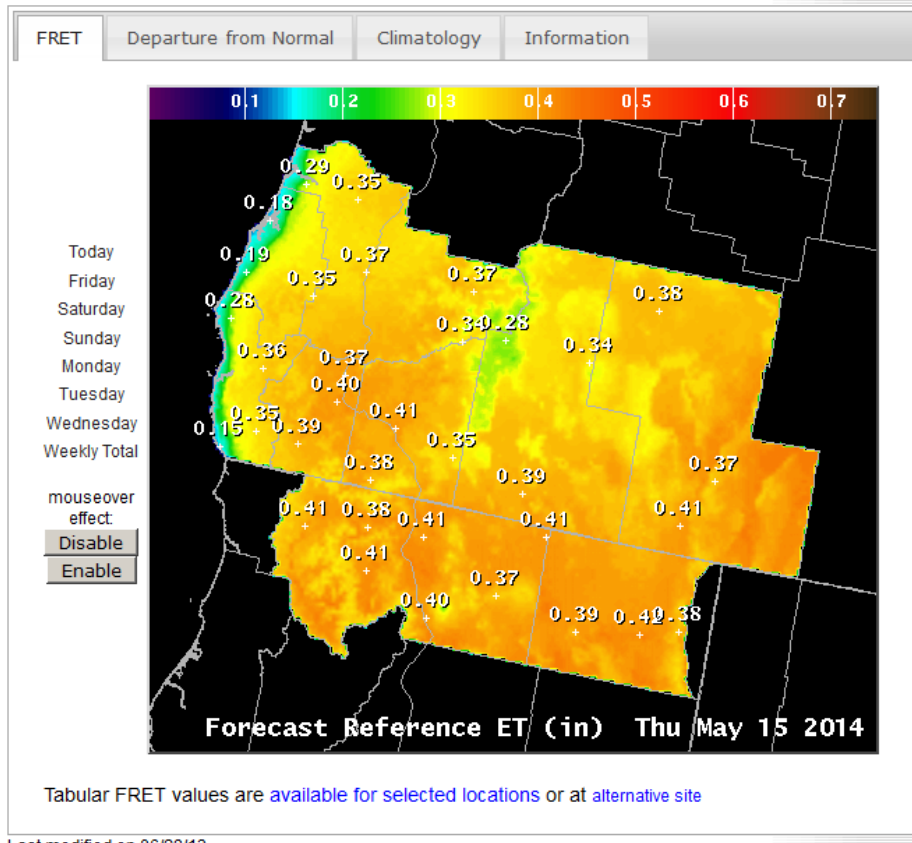
The Experimental Forecast Reference Evapotranspiration (FRET) for short canopies are an experimental product that will be posted to this page for evaluation until May 31, 2013. During this period, we encourage your comments or suggestions for improvements using the electronic survey provided. Your feedback will help us determine product utility, if modifications are needed, and whether the product should become part of the operational suite. Please see the information tab for more information on this product.

Note: Site specific FRET values are available by clicking on the map or typing in a location at: <http://www.wrh.noaa.gov/forecast/wxtables/index.php?wfo=mfr>

Please fill out the survey at: <http://www.weather.gov/survey/nws-survey.php?code=RESCV>

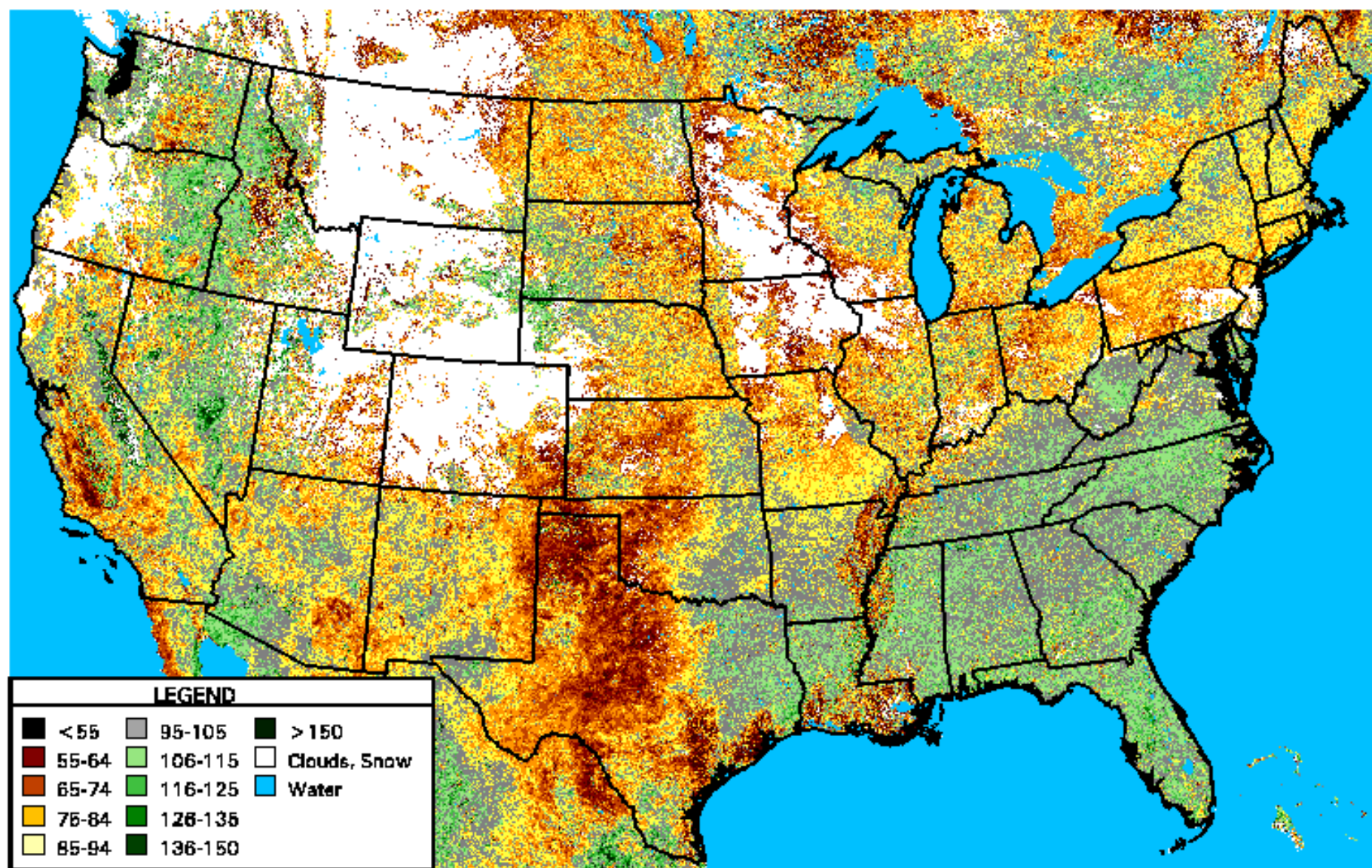
FRET Neighbors





www.wrh.noaa.gov/forecast/evap/FRET/FRET.php?wfo=mfr

Departure from Average Greenness: May 06 - May 12 2014

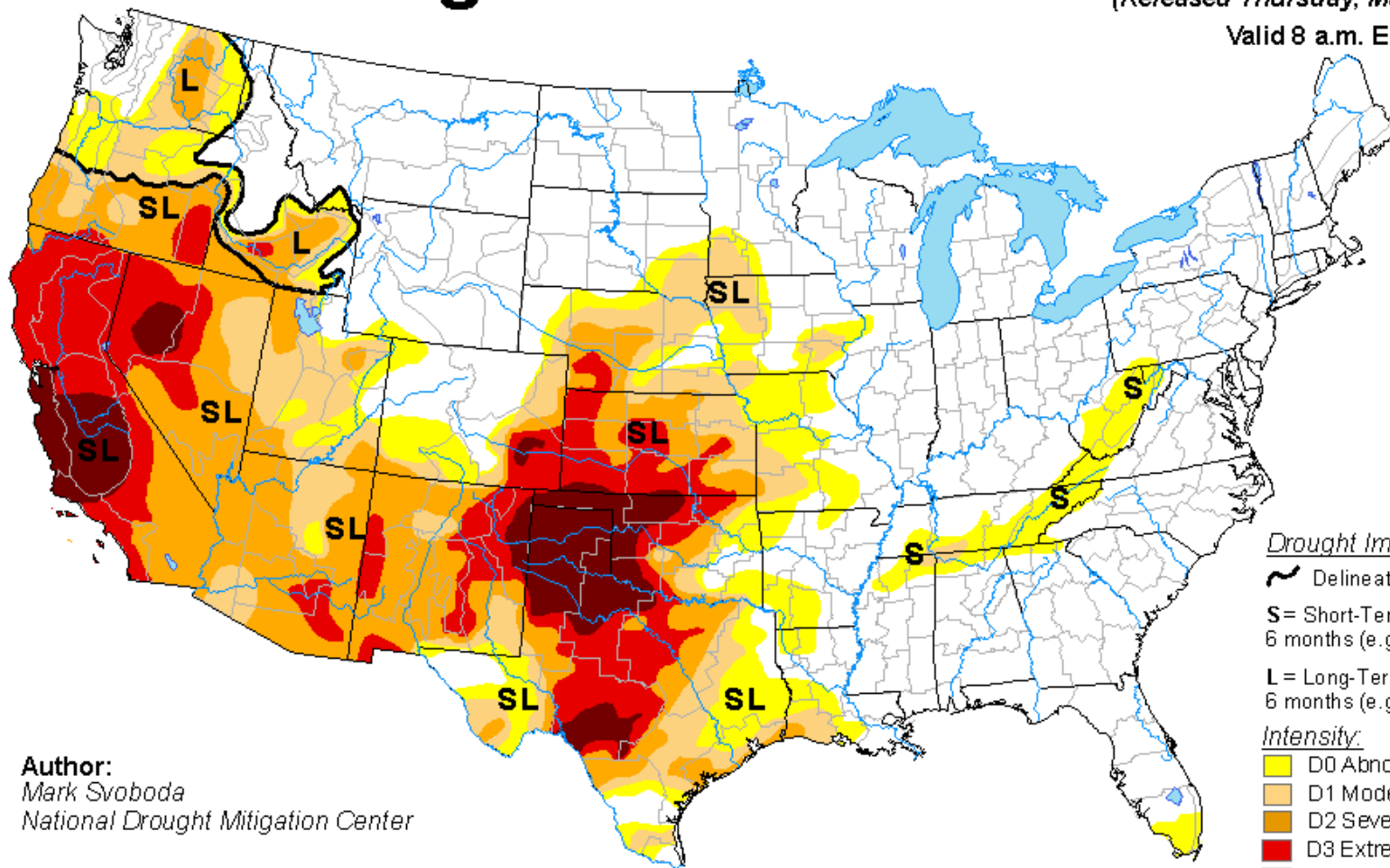


U.S. Drought Monitor

May 13, 2014

(Released Thursday, May. 15, 2014)

Valid 8 a.m. EDT



Author:
Mark Svoboda
National Drought Mitigation Center

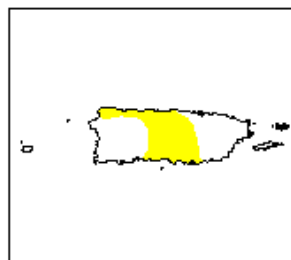
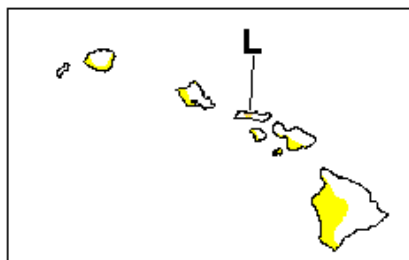
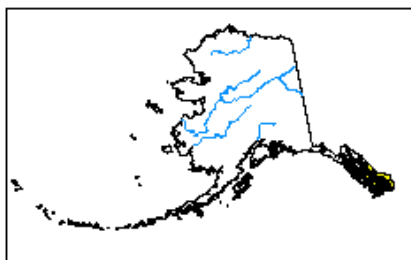
Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- Yellow: D0 Abnormally Dry
- Light Orange: D1 Moderate Drought
- Orange: D2 Severe Drought
- Red: D3 Extreme Drought
- Dark Red: D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

Select: Klamath Falls area, 12 months ending in Dec, Temperature 0 C, 9-year running mean.

North American Freezing Level Tracker

<http://www.wrcc.dri.edu/>

About

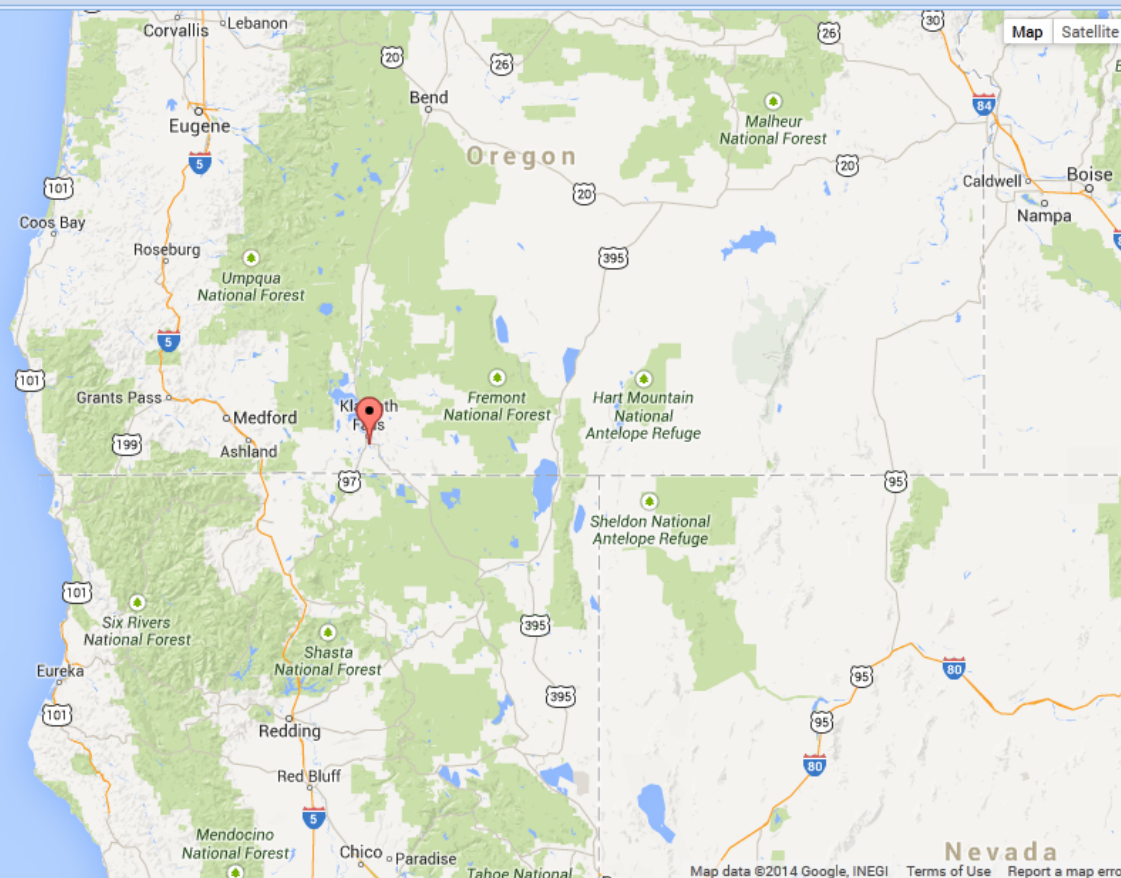
Introduction

This analysis tool allows one to track through time the height of the freezing level (0 C or 32 F) above sea level. Freezing level has important effects on hydrology in mountain environments. This level affects 1) the elevation of the rain/snow line, 2) whether precipitation at a specified level falls as rain or as snow, 3) whether the ground is frozen or thawed when the first autumn snows fall, 4) the efficiency of snowpack accumulation through the winter months, 4) the internal temperature and rate of "ripening" and melting of the snowpack in the spring, and 6) the length of the snow free season at different elevations. Freezing level also affects ecological function through biological growth rates (both plants and animals) at different elevations. Other temperature thresholds of interest are available (10 C, 20 C, 30 C / 50 F, 68 F, 86 F) as well. These temperatures

Contact

Location Selection

Display Options



How to use

Monthly/Seasonal Listings

Monthly/seasonal Time Series

This product shows the mean height of the s

Lat: 42.17154633452751

Lon: -121.7724609375

Span: 12 Months

End	Dec	
-----	-----	--

Month: _____

Level: 0 C

Running 9 Years

average:

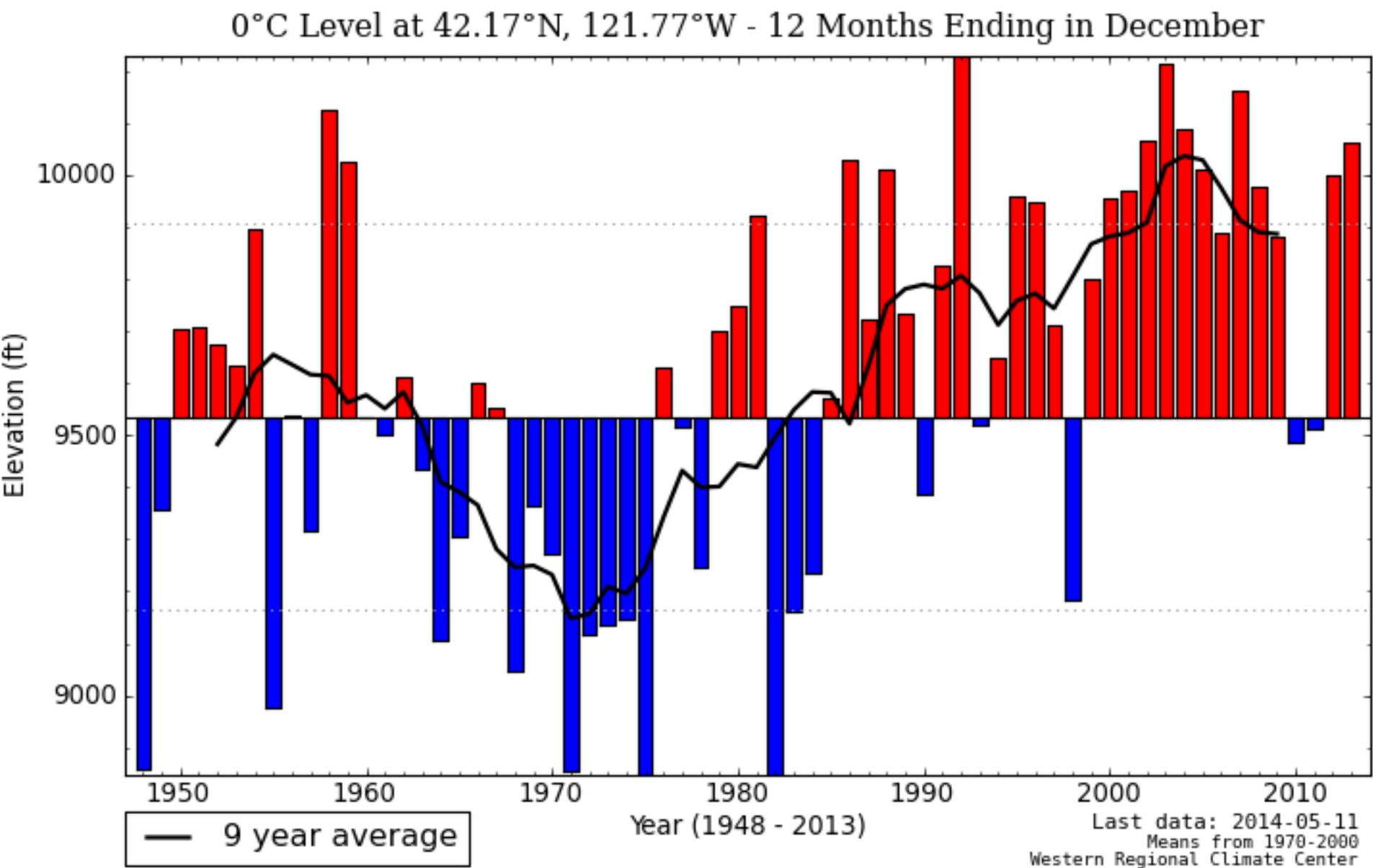
Units:

Go

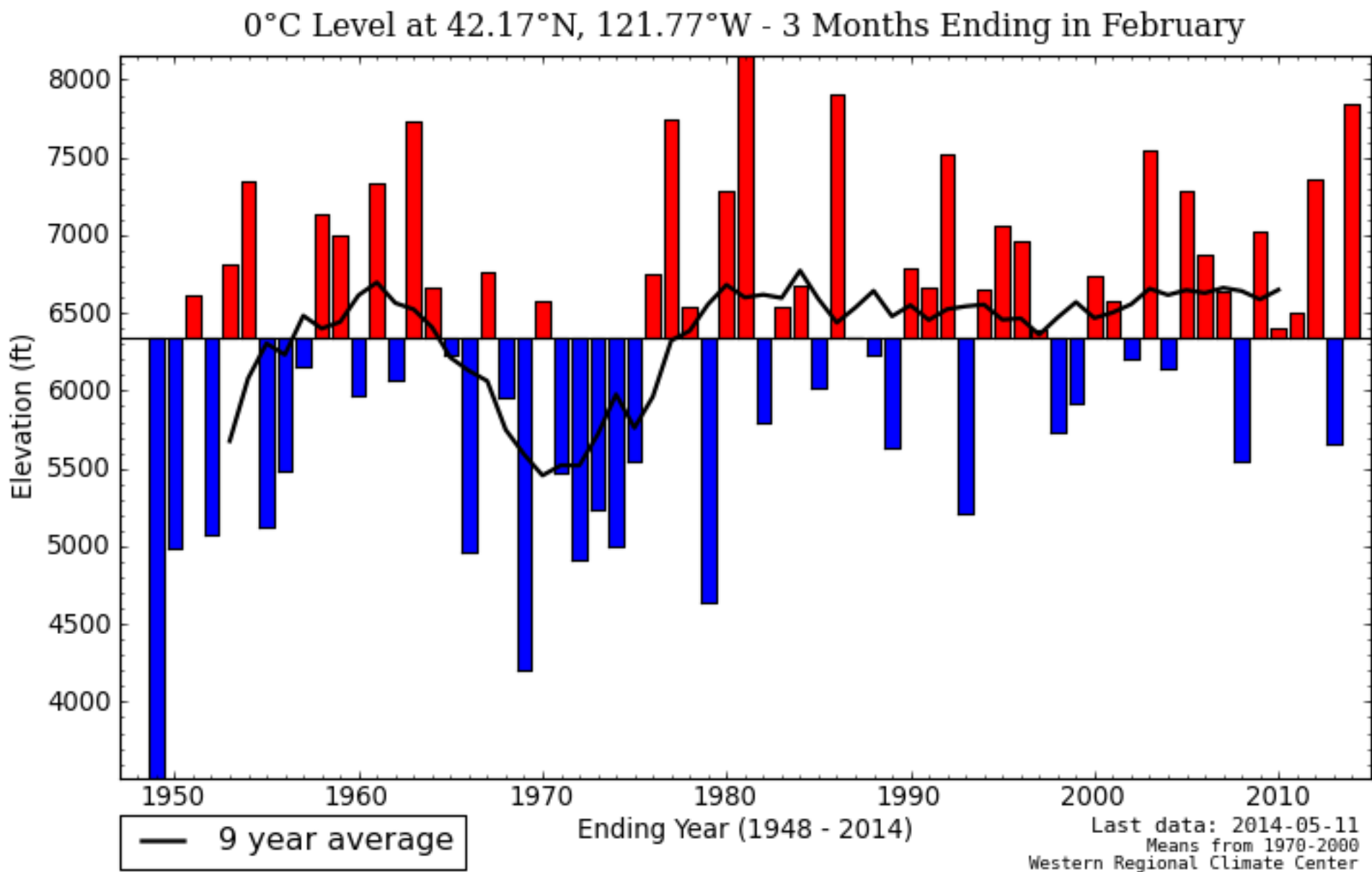
Last 12 Months

Monthly Precip as Snow

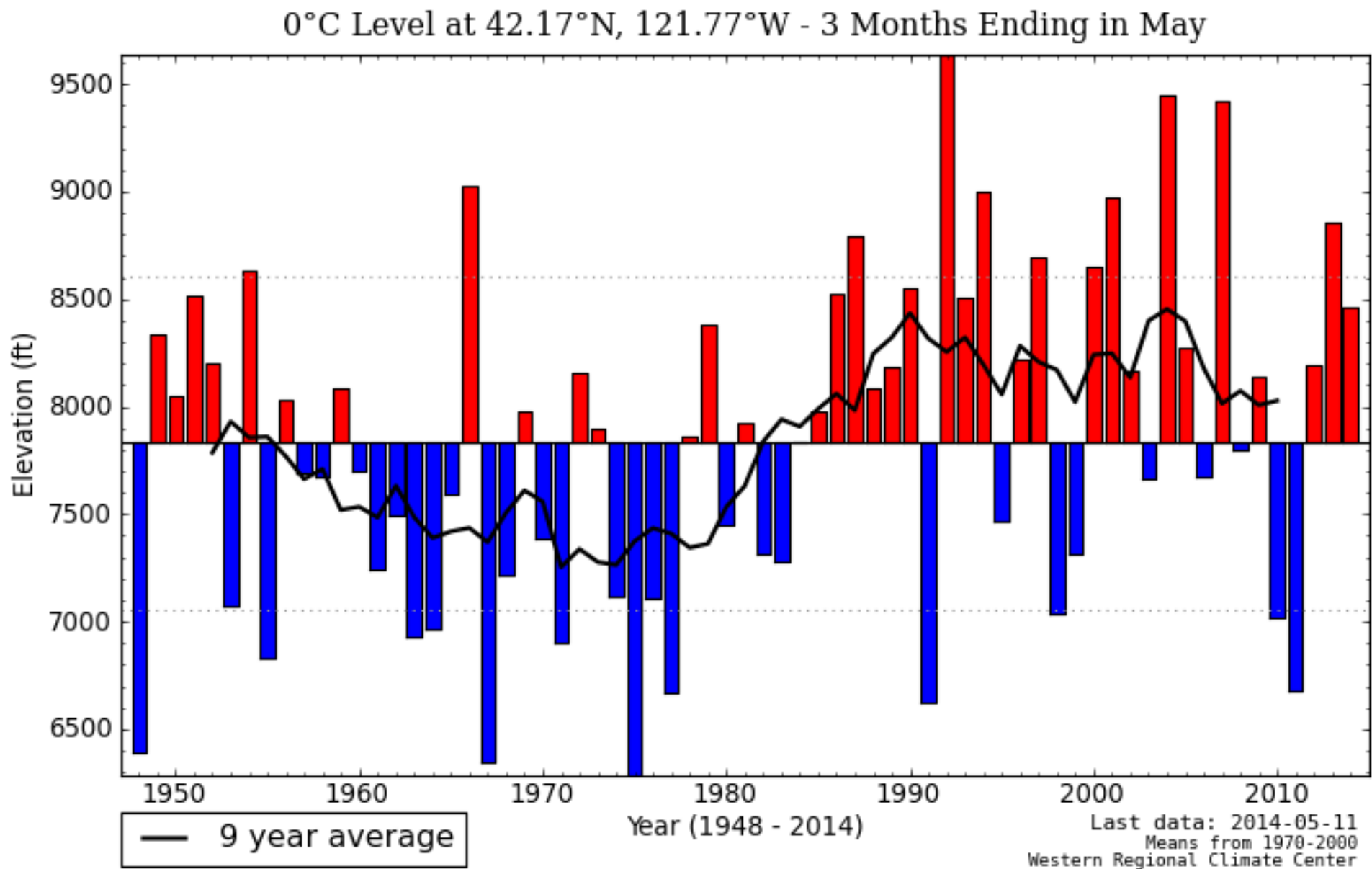
Elevation of Freezing Level over Klamath Falls. Annual. 1948 through 2013.



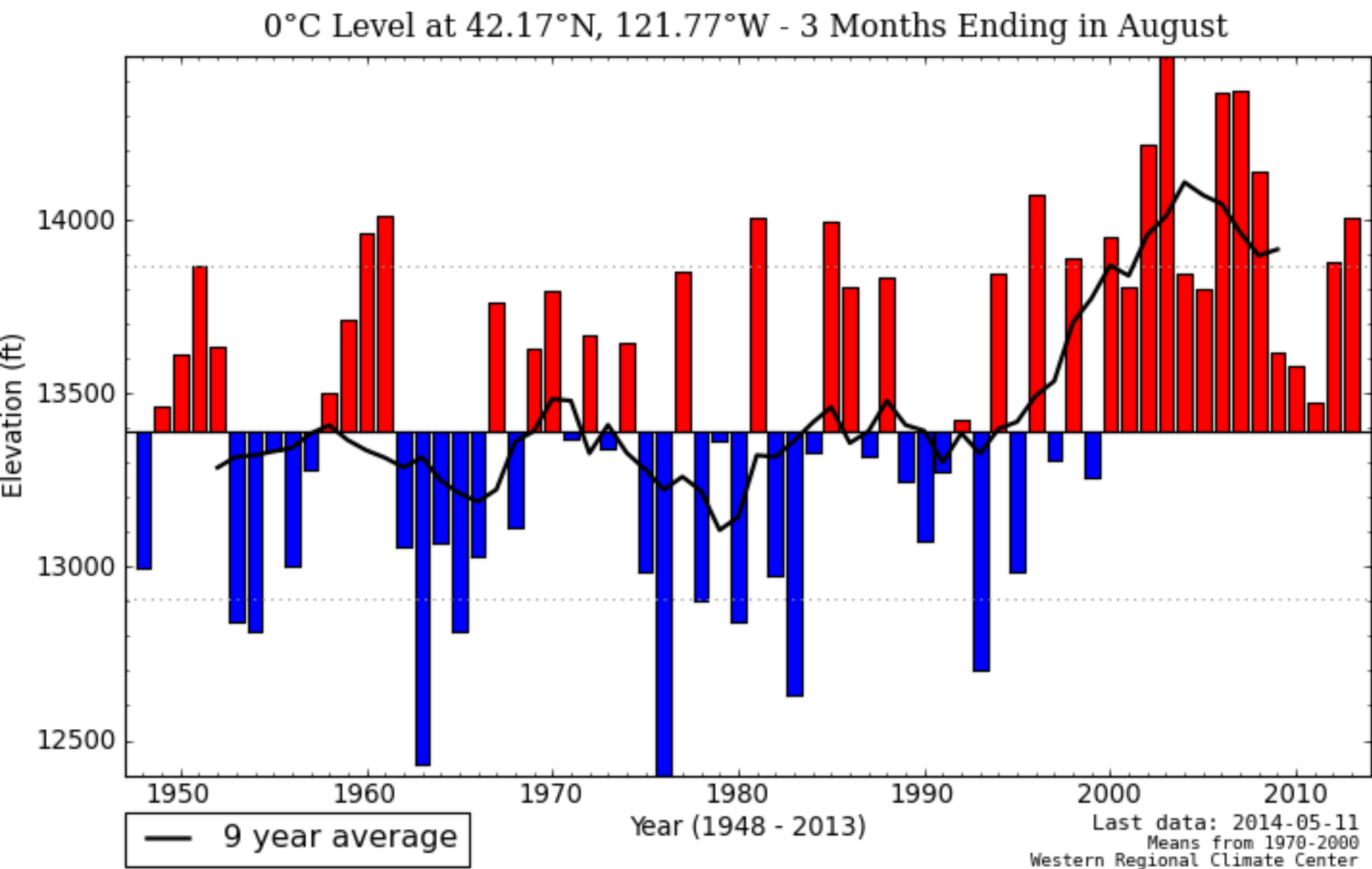
Elevation of Freezing Level over Klamath Falls. Winter. 1948-49 thru 2013-14.



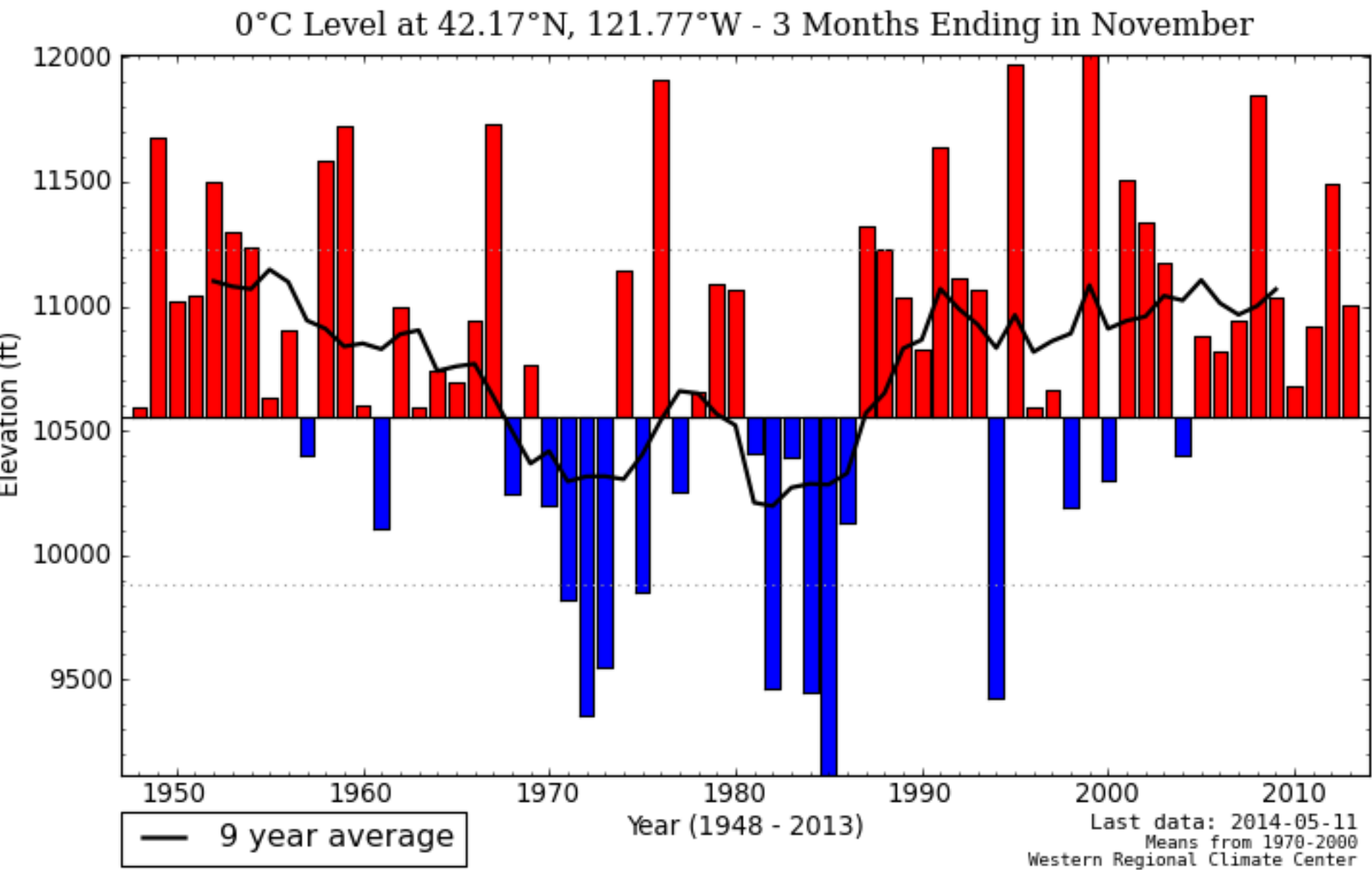
Elevation of Freezing Level over Klamath Falls . Spring. 1948 thru 2014.



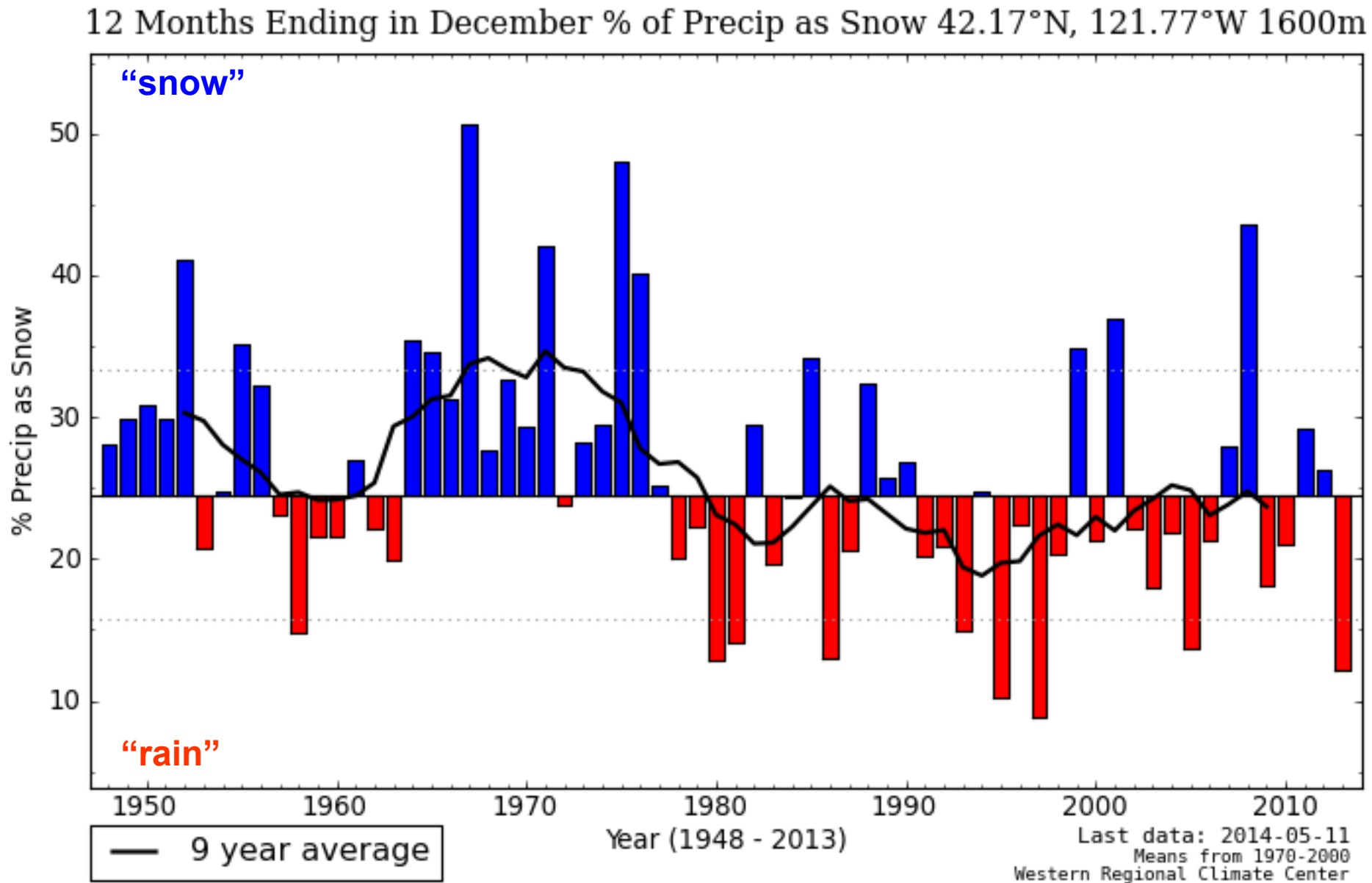
Elevation of Freezing Level over Klamath Falls. Summer. 1948 thru 2013.



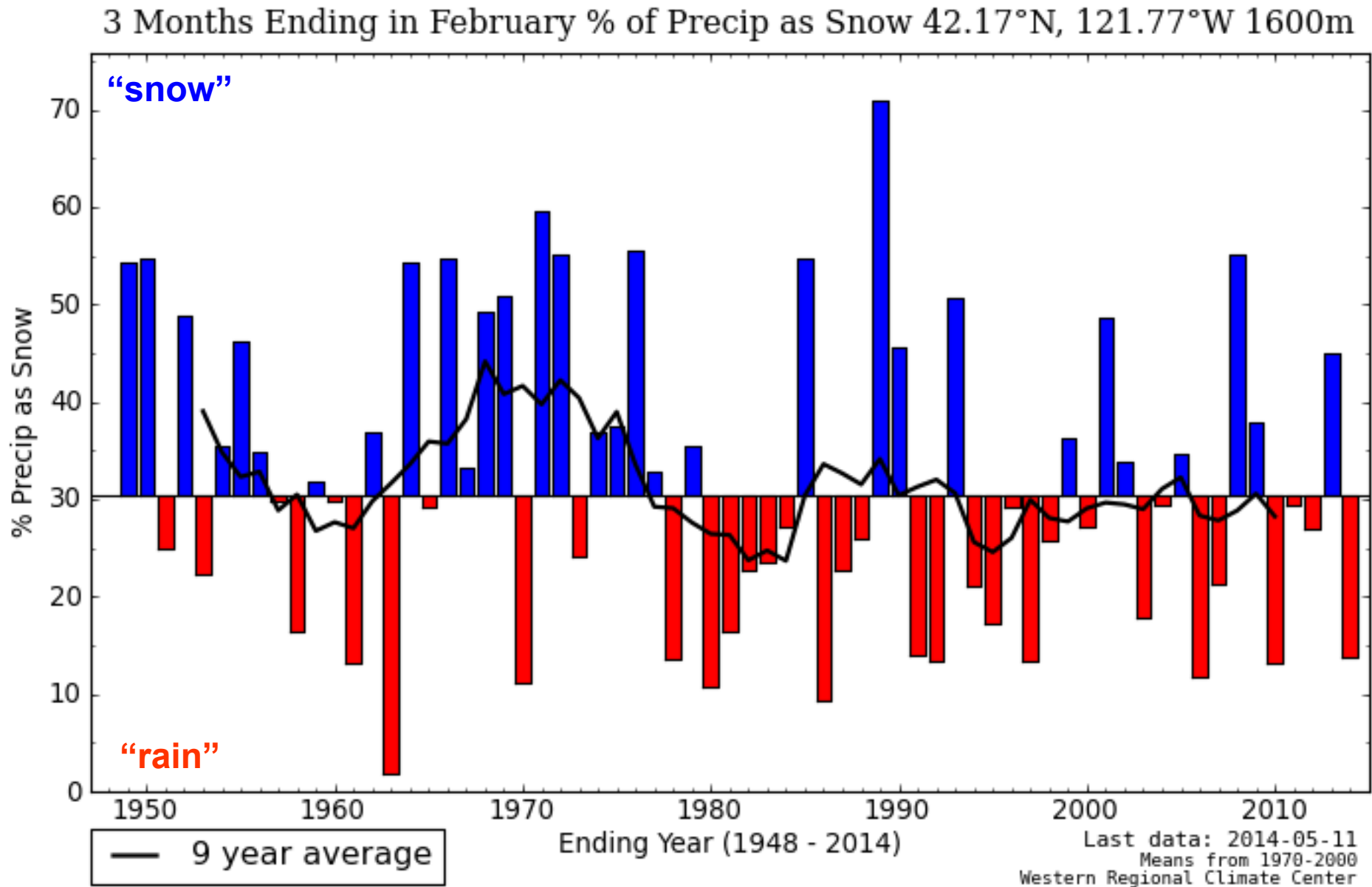
Elevation of Freezing Level over Klamath Falls. Autumn. 1948 thru 2013.



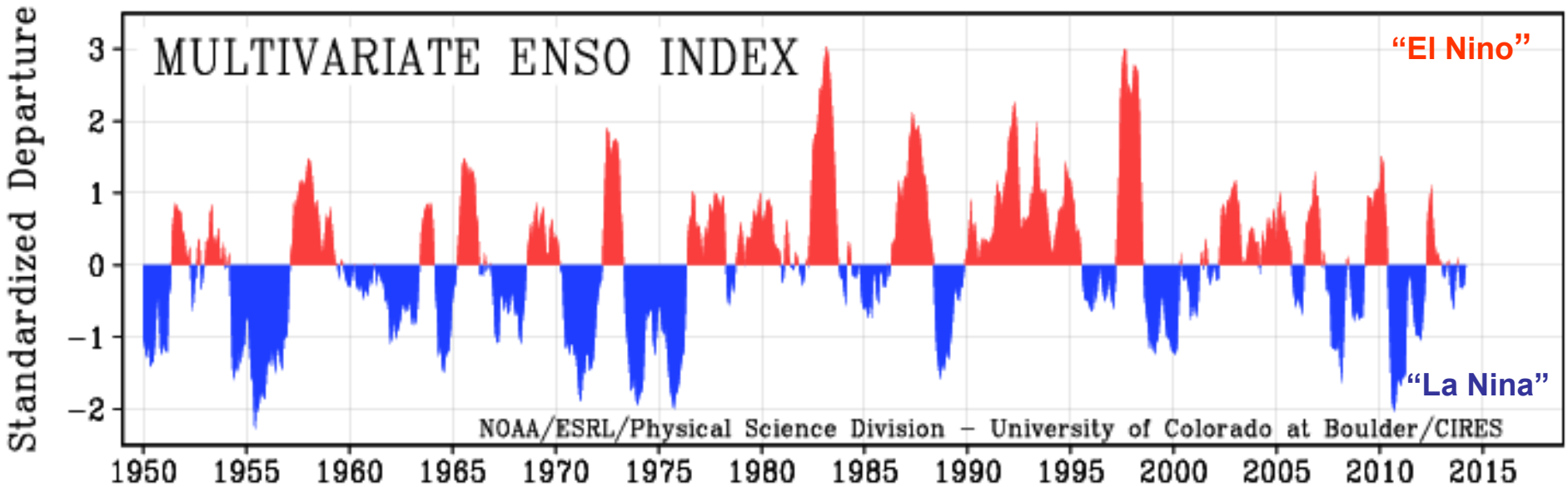
**Percent of Reanalysis precipitation with below-freezing temperature at 1600 m / 5200 ft.
Klamath Falls Area. Annual 1948 - 2013.**



**Percent of Reanalysis precipitation with below-freezing temperature at 1600 m / 5200 ft.
Klamath Falls Area. Winter (DJF) 1948/49 - 2013/14.**



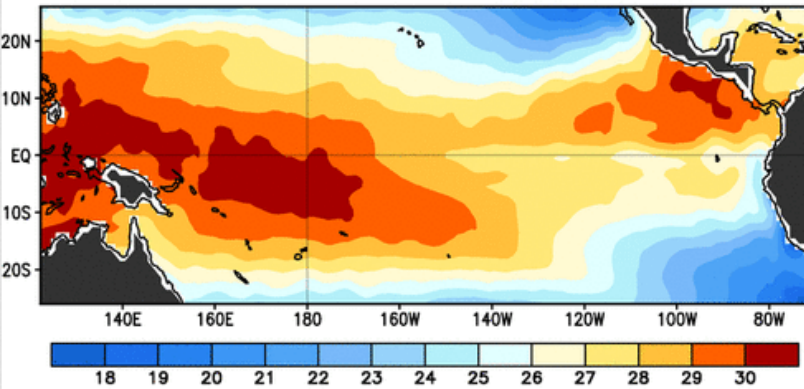
Through April 2014



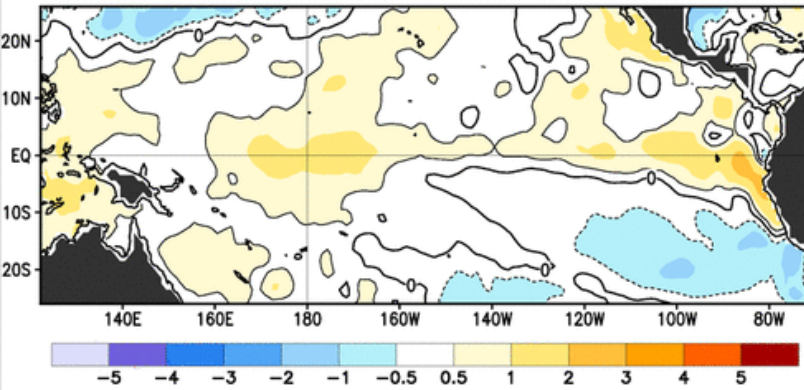
NOAA ESRL ("CDC"), Wolter and Timlin

Recent Evolution of Equatorial Pacific SST Departures

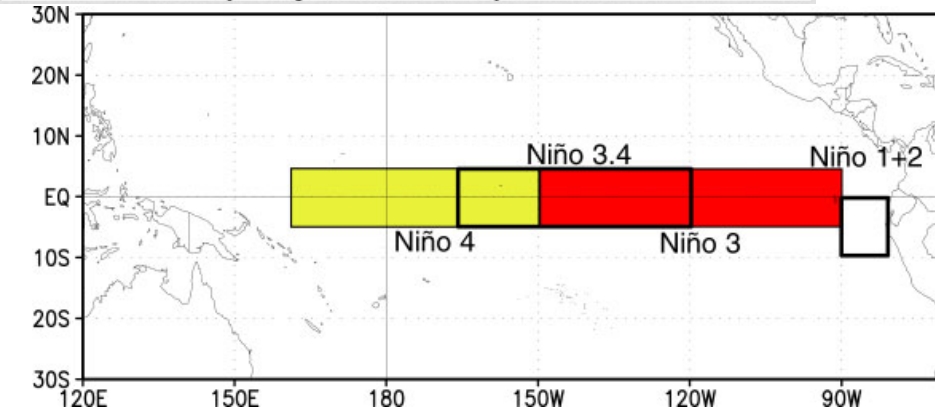
Observed Sea Surface Temperature (°C)



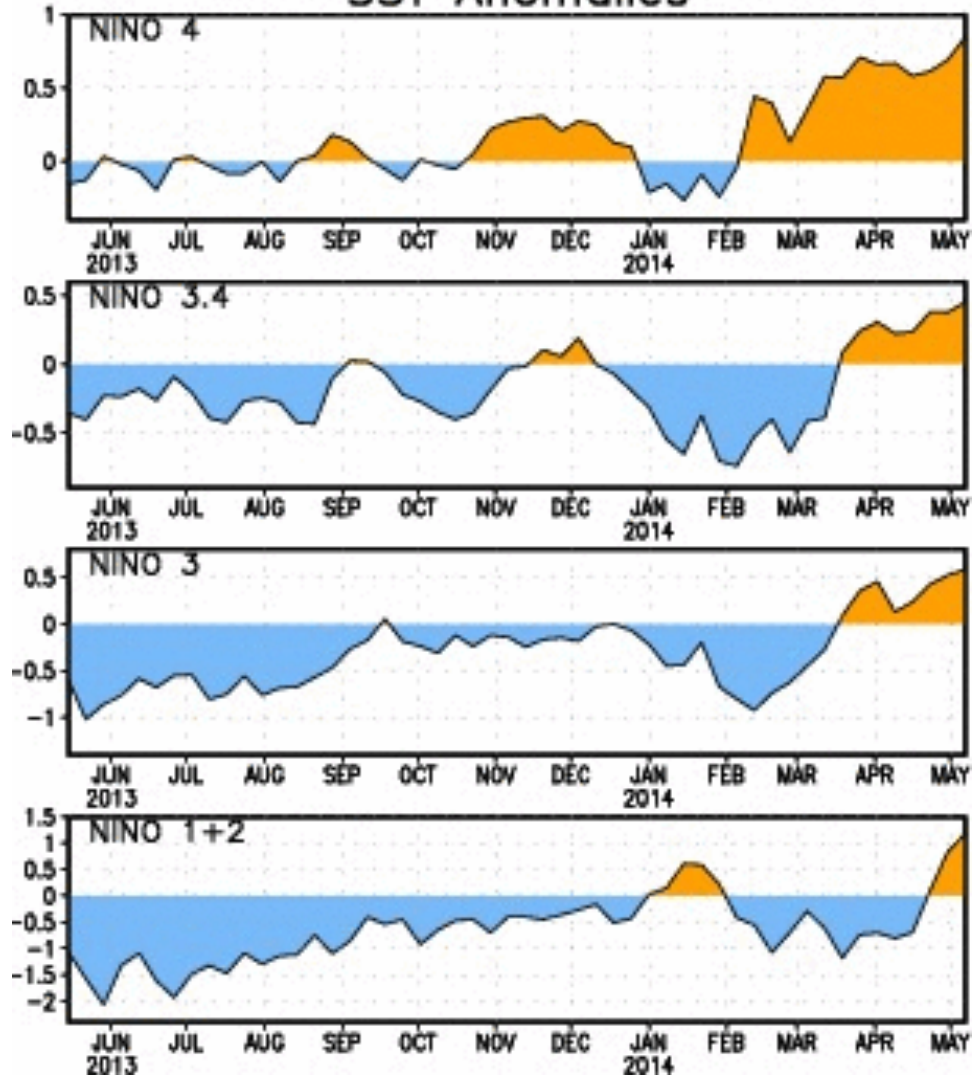
Observed Sea Surface Temperature Anomalies (°C)



7-day Average Centered on 07 May 2014

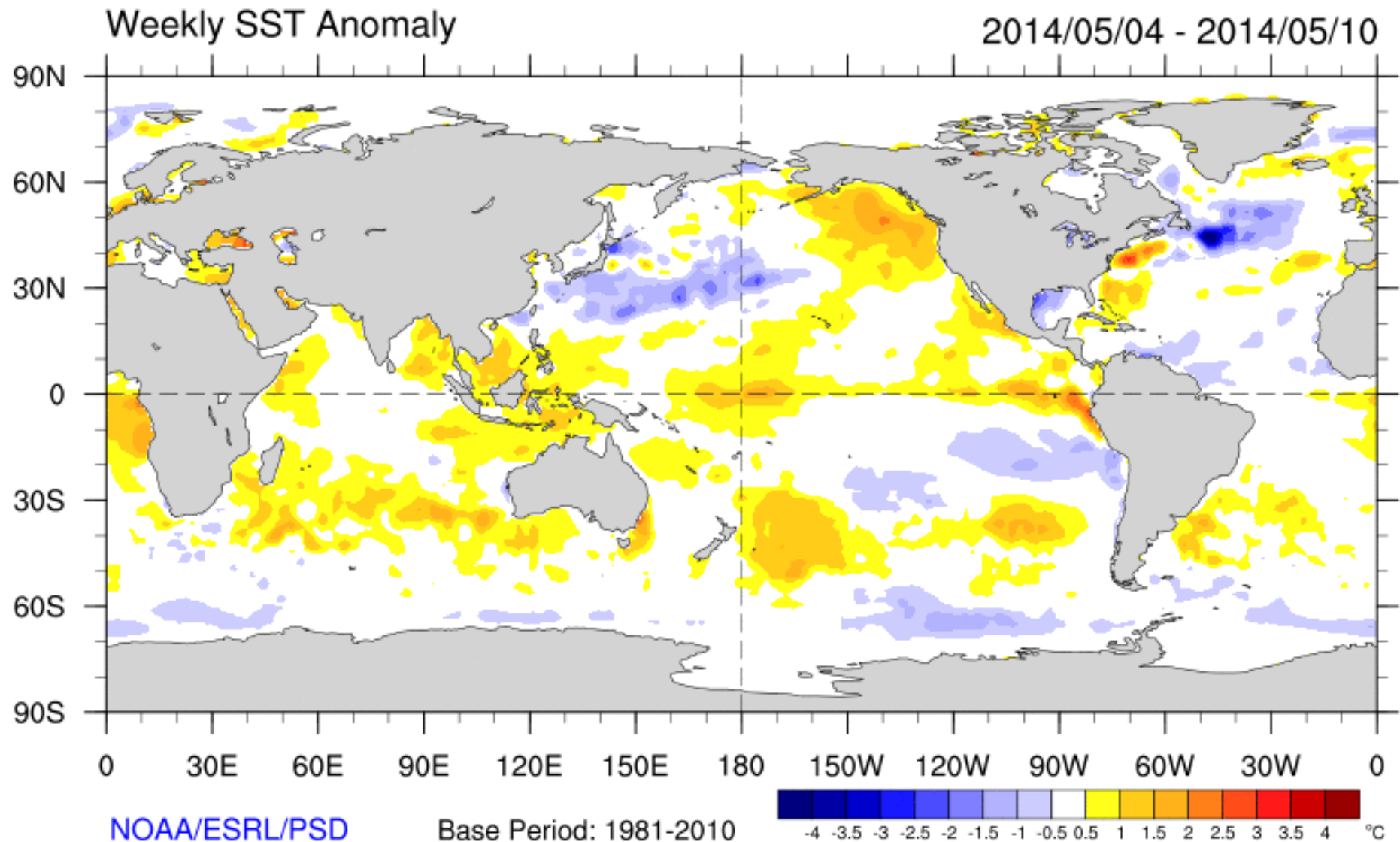


SST Anomalies



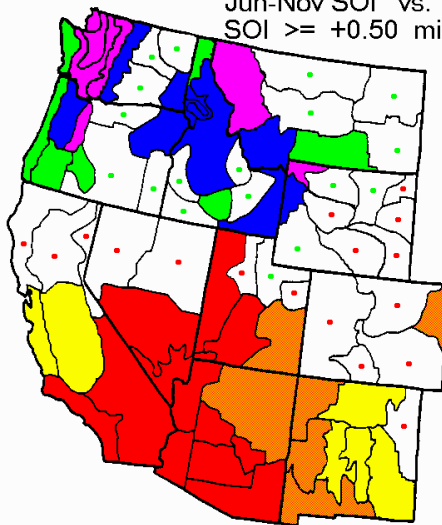
Updated through 2014 May 4-10

Ocean Departures from Average Temperature (C) 4-10 May 2014



Split Samples:

Jun-Nov SOI vs. Oct-Mar Precip
SOI $\geq +0.50$ minus SOI ≤ -0.50



- $t > 0, p \leq 0.001$
- $t > 0, p \leq 0.01$
- $t > 0, p \leq 0.05$
- $t > 0, p > 0.05$
- $t < 0, p > 0.05$
- $t < 0, p \leq 0.05$
- $t < 0, p \leq 0.01$
- $t < 0, p \leq 0.001$

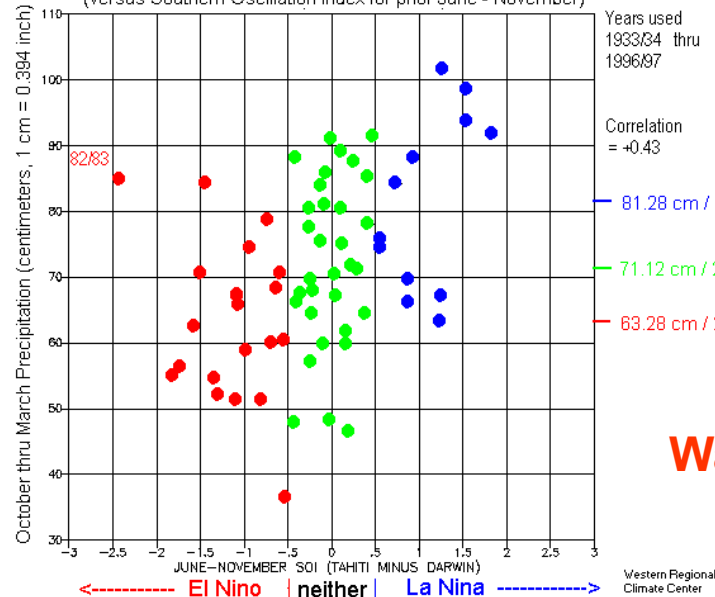
Updated from Redmond and Koch (1991). Winters of 1933/34 - 1994/95.
Reddish: Composite El Nino winters are wet, La Nina winters are dry.
Bluish/greenish: Composite El Nino winters are dry, La Nina winters are wet.

Redmond, K.T., and R.W. Koch, 1991. Surface climate and streamflow variability in the western United States and their relationship to large-scale circulation indices. Water Resources Research, 27(9), 2381-2399.

Redmond & Koch, 1991, updated.

ENSO

Washington statewide October thru March Precipitation (versus Southern Oscillation Index for prior June - November)



Years used
1933/34 thru
1996/97

Correlation
= +0.43

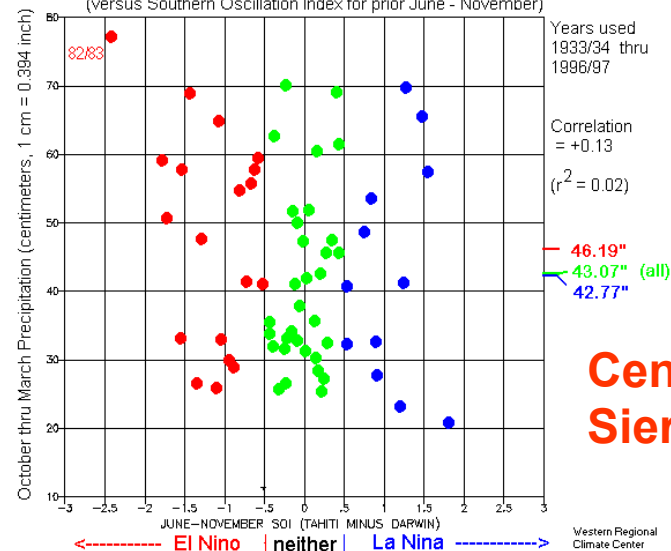
81.28 cm / 32.00"

71.12 cm / 28.00" (all)

63.28 cm / 24.91"

Washington

California 8-Station Index October thru March Precipitation (versus Southern Oscillation Index for prior June - November)



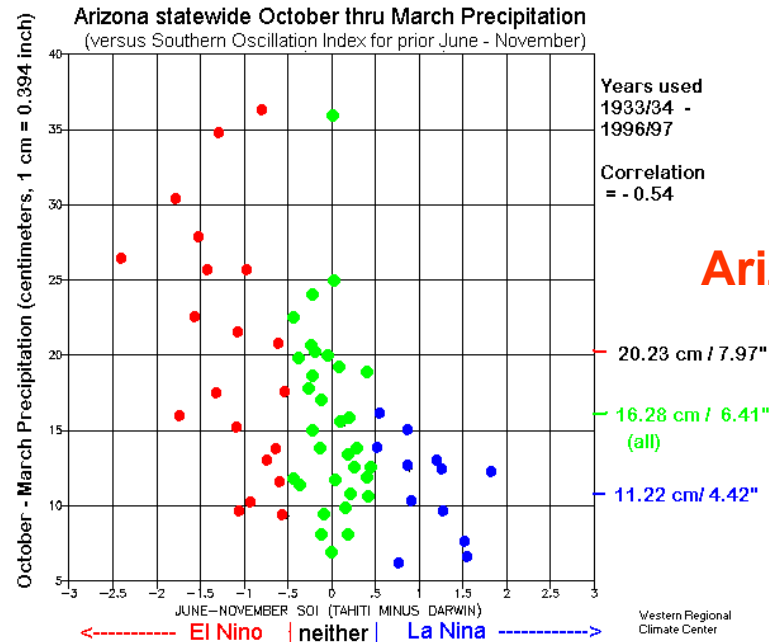
Years used
1933/34 thru
1996/97

Correlation
= +0.13
($r^2 = 0.02$)

46.19"
43.07" (all)
42.77"

Central Sierra

Arizona statewide October thru March Precipitation (versus Southern Oscillation Index for prior June - November)



Years used
1933/34 -
1996/97

Correlation
= -0.54

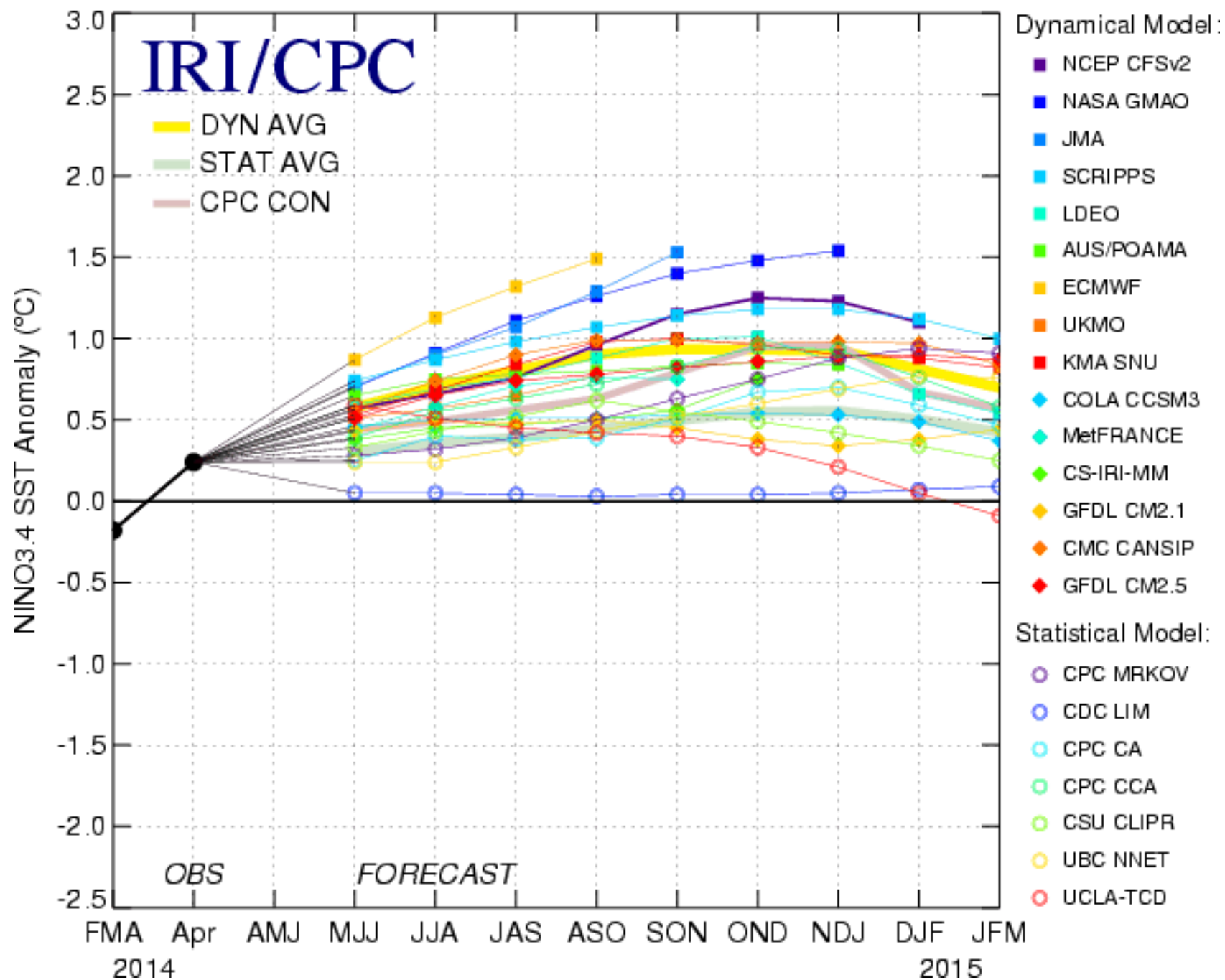
20.23 cm / 7.97"

16.28 cm / 6.41"
(all)

11.22 cm / 4.42"

Arizona

Mid-May 2014 Plume of Model ENSO Predictions



Temperature & Precipitation Official Outlooks 2014

One Month

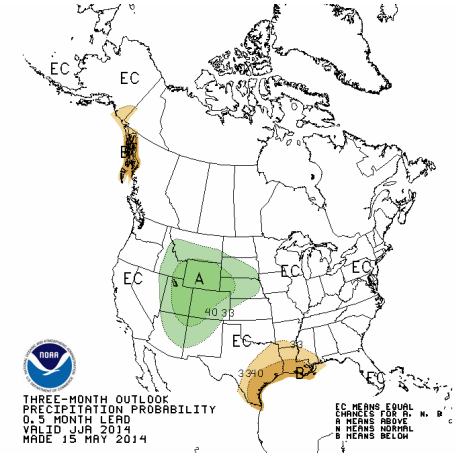
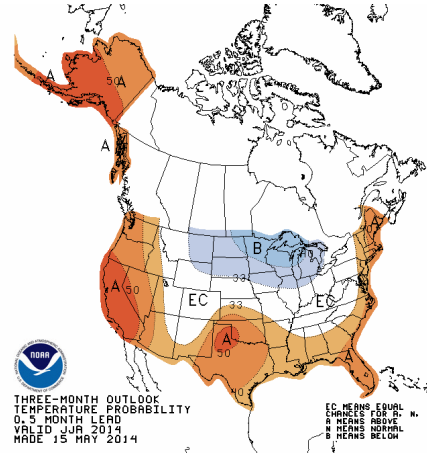
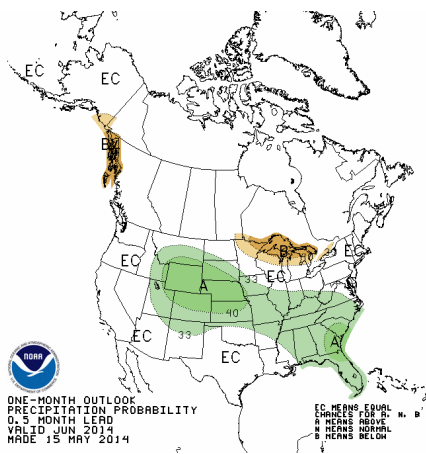
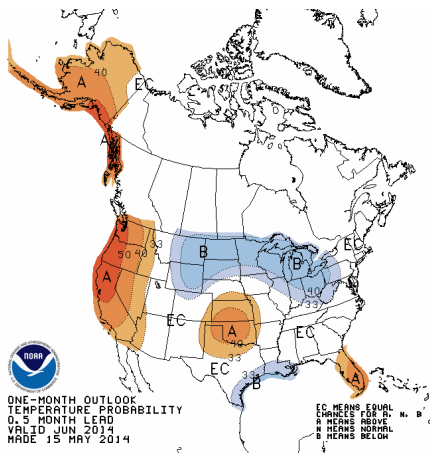
Three Month

Jun Temp

Jun Precip

Jun-Jul-Aug T

Jun-Jul-Aug P



Orange / Red
Green

- Higher likelihood of drier than usual
- Higher likelihood of wetter than usual

NOAA Climate Prediction Center

Six experiments in near-term climate forecasting Jun-Aug 2014. Precipitation.

NMME (National Multi-Model Ensemble).

IMME (International Multi-Model Ensemble).

Dynamical Models

CFSv2: US Climate Forecasting System version 2

CMC1: Canadian Meteorological Center version 1

CMC2: Canadian Meteorological Center version 2

GFDL: US Geophysical Fluid Dynamics Laboratory

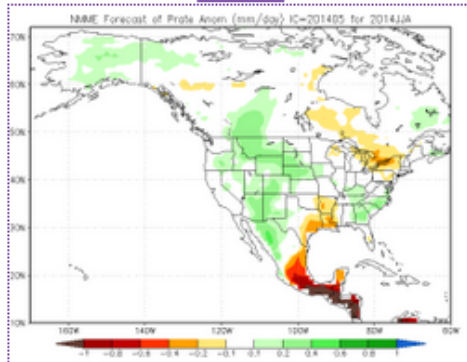
NCAR: US National Center for Atmospheric Research

NASA: US National Aeronautics and Space Administration

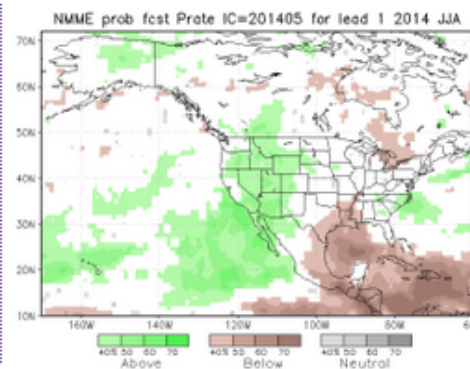
NMME: National Multi-Model Ensemble

IMME: International Multi-Model Ensemble

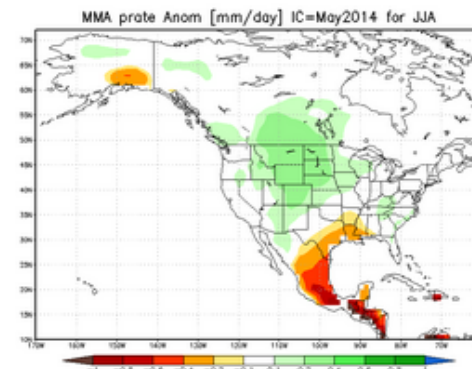
NMME



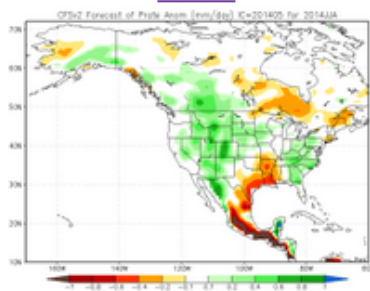
Prob fcst



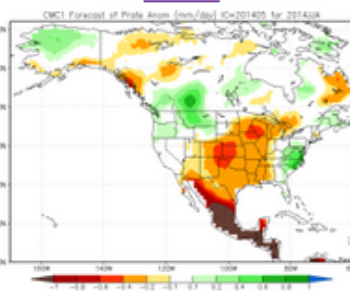
IMME



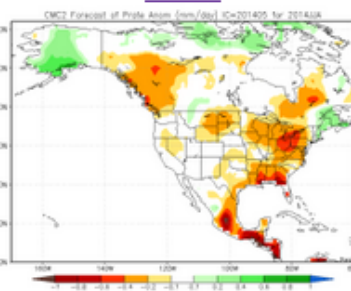
CFSv2



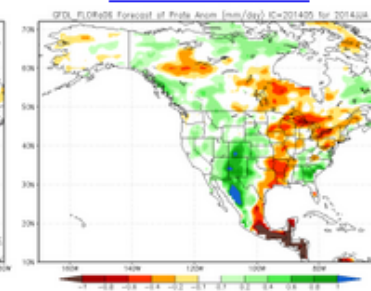
CMC1



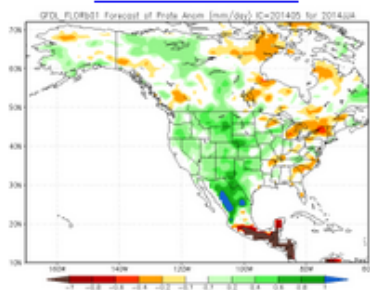
CMC2



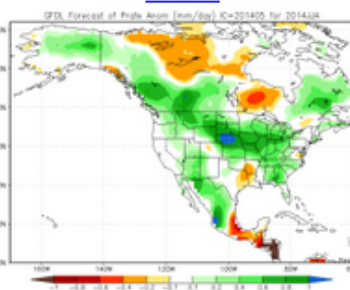
GFDL FLORa06



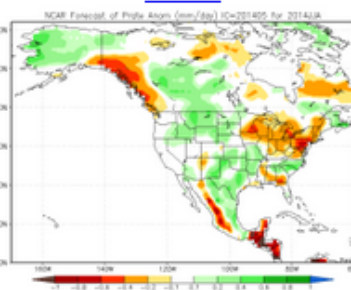
GFDL FLORb01



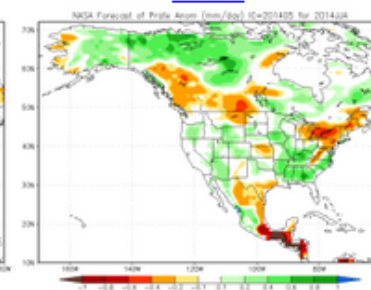
GFDL



NCAR



NASA



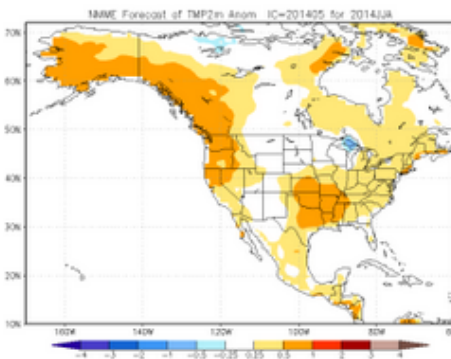
2014 May 15

Six experiments in near-term climate forecasting Jun-Aug 2014. Temperature.

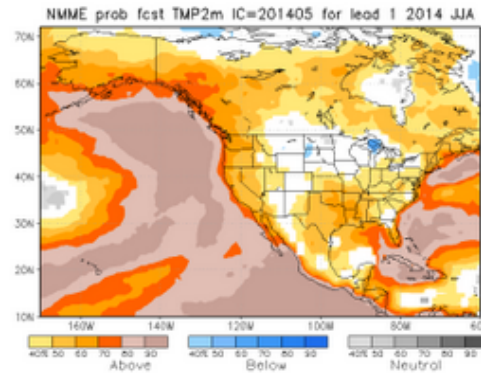
NMME (National Multi-Model Ensemble).
IMME (International Multi-Model Ensemble).

Dynamical Models

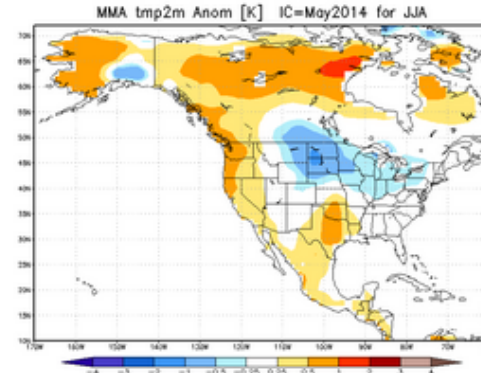
NMME



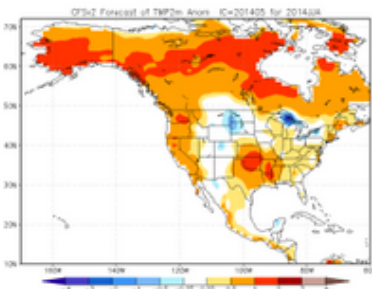
Prob fcst



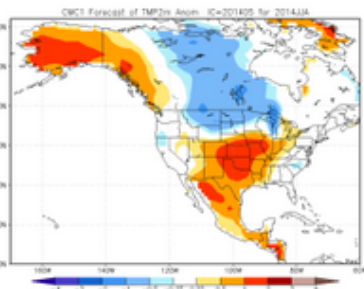
IMME



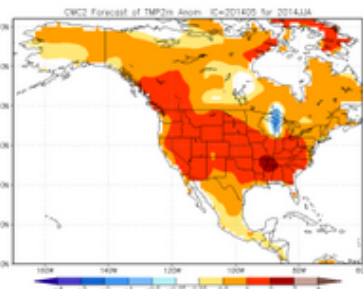
CFSv2



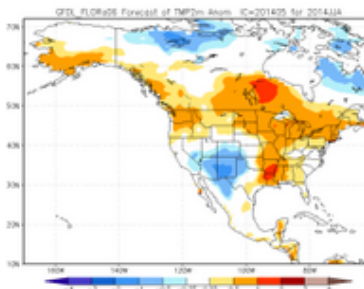
CMC1



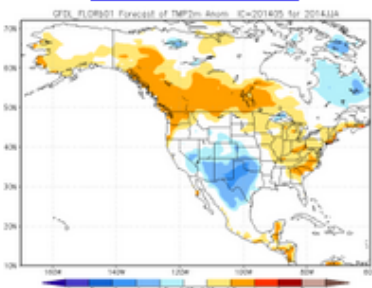
CMC2



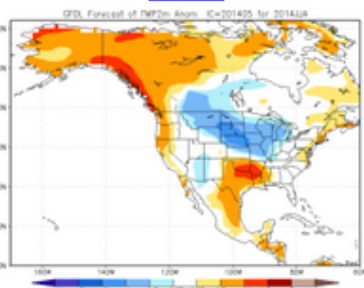
GFDL FLORa06



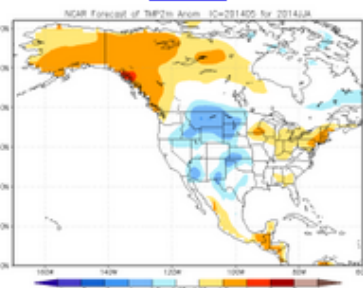
GFDL FLORb01



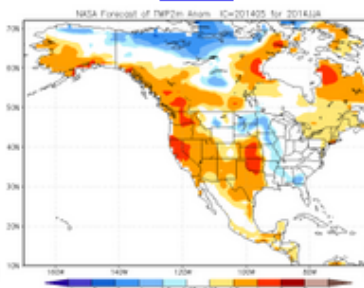
GFDL



NCAR



NASA



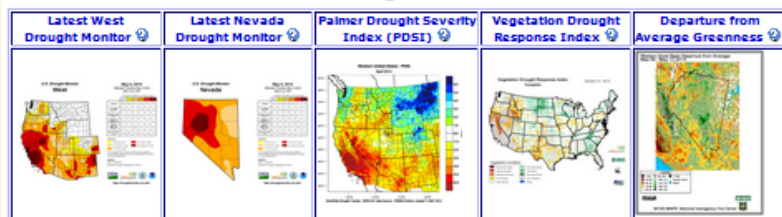
CFSv2: US Climate Forecasting System version 2
CMC1: Canadian Meteorological Center version 1
CMC2: Canadian Meteorological Center version 2
GFDL: US Geophysical Fluid Dynamics Laboratory
NCAR: US National Center for Atmospheric Research
NASA: US National Aeronautics and Space Administration
NMME: National Multi-Model Ensemble
IMME: International Multi-Model Ensemble

2014 May 15

Latest Drought Information and Assistance

Your agency's newsletter can be linked here- please let us know if you produce one!

General Drought Information



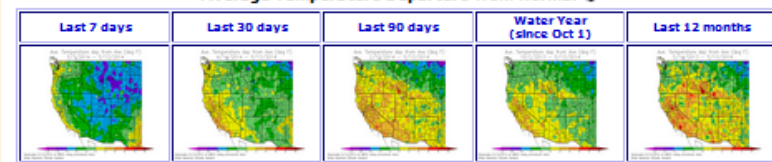
Links: US Drought Monitor | Westwide Drought Tracker | VegDRI | AVHRR NDVI Greenness

Current Weather and Satellite Imagery



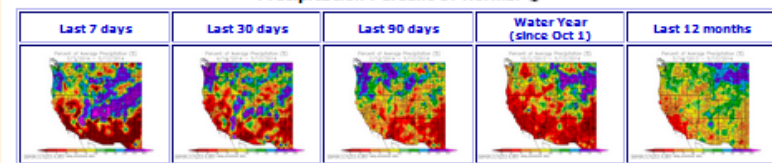
Links: NWS Radar Imagery | NCAR Forecast Tools | NOAA/NESDIS Satellite Imagery

Average Temperature Departure from Normal



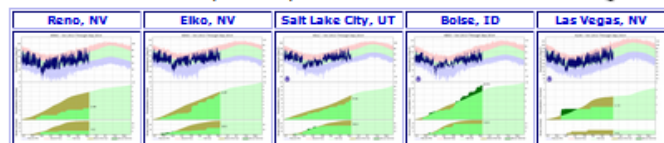
Links: WRCC Climate Anomaly Maps | NCDC Normals Info

Precipitation Percent of Normal



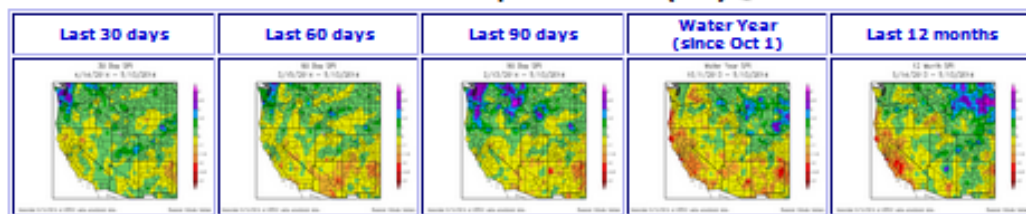
Links: WRCC Climate Anomaly Maps | NCDC Normals Info

NWS Observations, Normals, and Records for Current Water Year



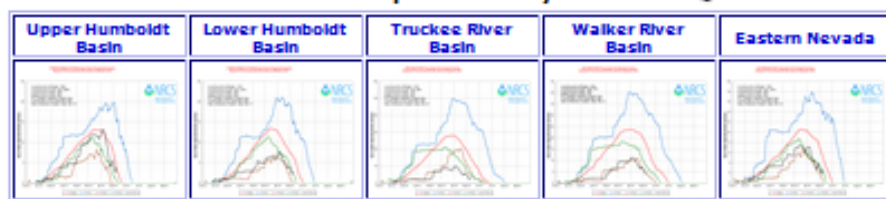
Links: NWS Reno | NWS Elko | NWS Salt Lake City | NWS Boise | NWS Las Vegas

Standardized Precipitation Index (SPI)



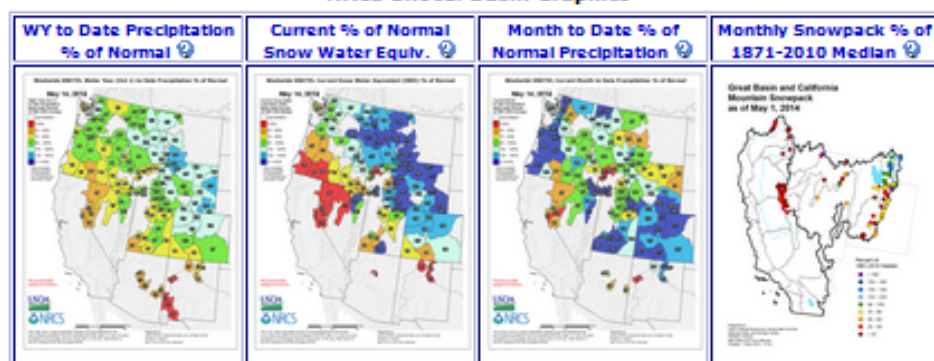
Links: NPREC Climate Summary Maps- SPI | NCDC SPI Info

Snotel Basin Snowpack Summary Time Series



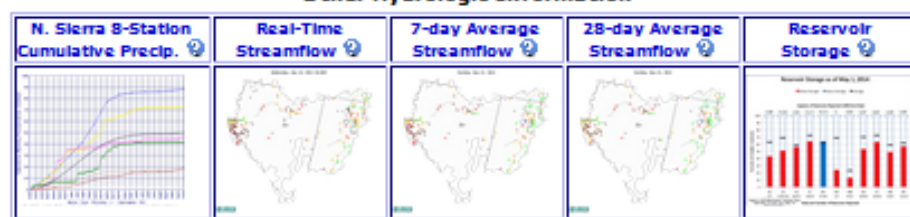
Links: NRCS Snotel | What is SWE?

NRCS Snotel Basin Graphics



Links: NRCS Snotel GIS Products

Other Hydrologic Information



Links: CDEC Sierra Precipitation | USGS Water Watch | About Waterwatch | NRCS Reservoir Info/Graphics

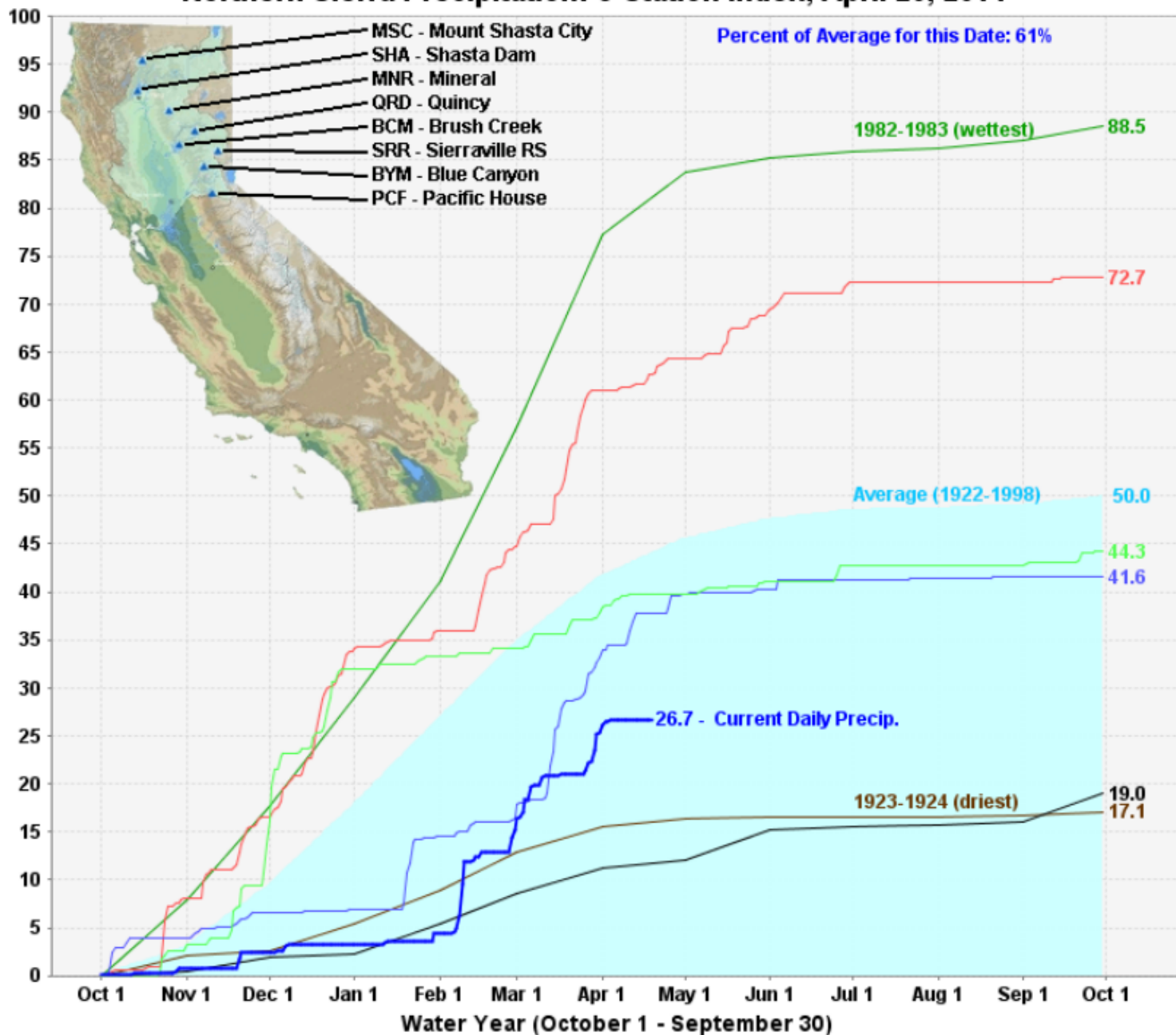
Northern Sierra Precipitation: 8-Station Index, April 20, 2014

California
Department
of
Water
Resources

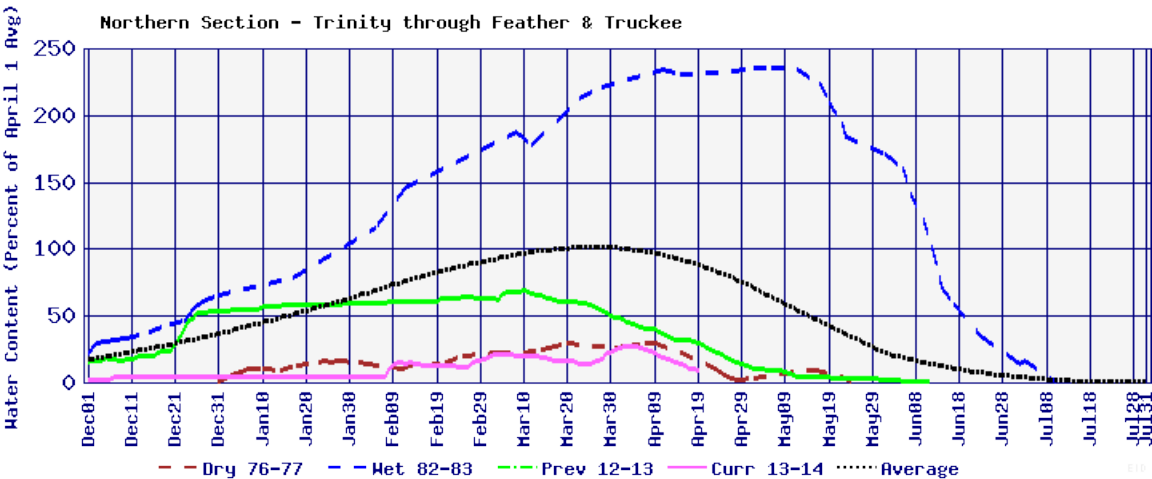
Create
Klamath
Analog

Cumulative Daily/Monthly Precipitation (inches)

Total Water Year Precipitation



Average (1922-1998) 1923-1924 (driest) 1976-1977 (2nd Driest) 1982-1983 (wettest) 2010-2011 2011-2012
 2012-2013 2013-2014 (current)

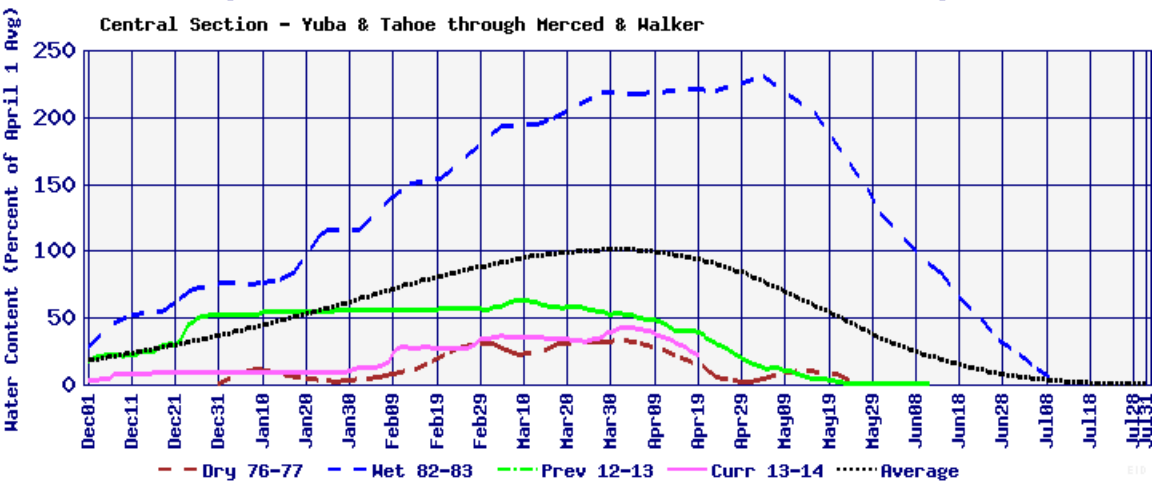


**Winter Season
Snow Water
Content**

**Northern
Sierra**

Create Klamath Analog

1982-83 wettest



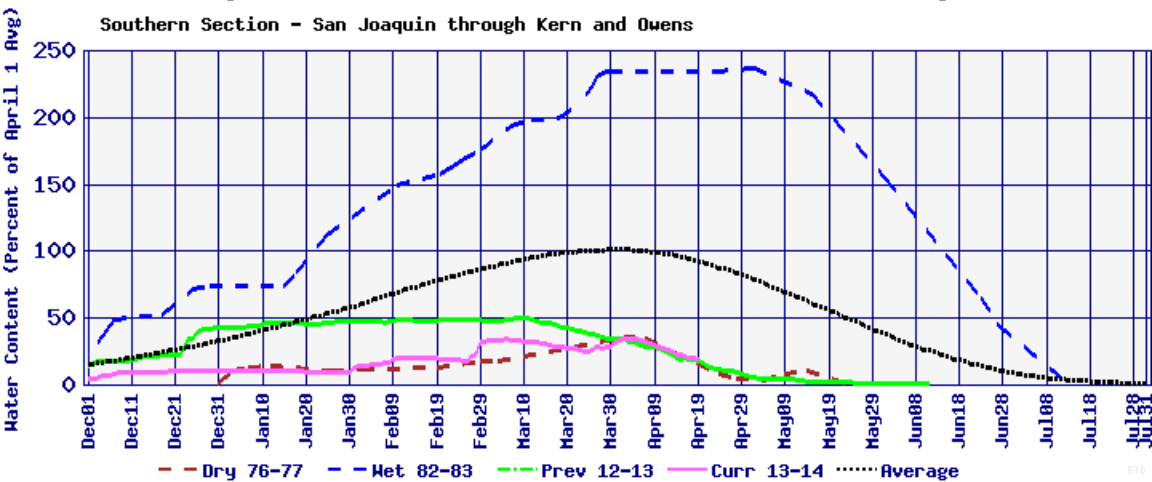
Average

2012-13

2013-14

**Central
Sierra**

1976-77 driest



**Southern
Sierra**

Cal DWR

Established Programming Rule:

If it's easy for the user, it was hard for the programmer.

If it's hard for the user, it was easy for the programmer.

Corollary:

Making things easy takes resources, often substantial.

Many parties would like this, but not willing to support.

Concluding Thoughts

Making it easy for users: Lotta work.

How to operationalize.

- Automated updating.**

- Keeping up with evolving web pages of others.**

 - Adds up over time: How to fund or fold into operations.**

- How to keep going when no drought or other climate anomalies.**

Dashboard appealing to users. But, Dashboard Fatigue for operators.

Cannot meet all user expectations.

- Tools to help select from among major options.**

Thank You !



www.klamathtribes.org

Blue

Red